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Natural Areas Inventory of Pender County, North Carolina

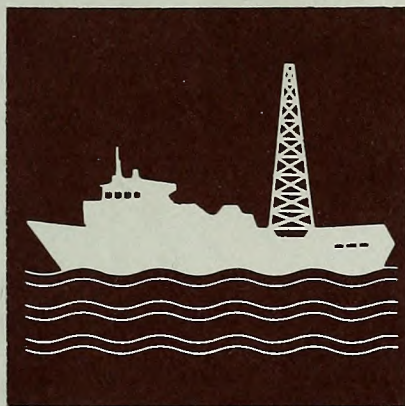
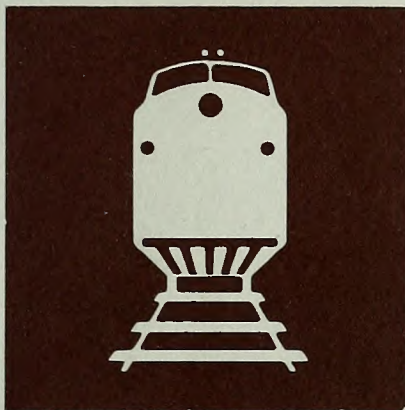
Steven W. Leonard
Richard J. Davis

JUL 20 1983

OCTOBER 1981

North Carolina
Coastal Energy Impact Program
Office of Coastal Management
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CEIP REPORT NO. 11



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NATURAL AREA INVENTORY OF PENDER COUNTY, NORTH CAROLINA

BY

Steven W. Leonard¹

Richard J. Davis

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The natural area inventory was supervised by the North Carolina Natural Heritage Program (Division of Parks and Recreation, N.C. Department of Natural Resources and Community Development).

Project No. 80-06

Contract No. C-6037

October, 1981

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P.O. Box 3475
Wilmington, NC 28406

PREFACE

The North Carolina Office of Coastal Management and the North Carolina Natural Heritage Program, both units of the Department of Natural Resources and Community Development, have commissioned a series of natural areas inventories for ten counties in the coastal zone of this state. The Pender County inventory was conducted in 1981 and was financed by a Coastal Energy Impact Program (CEIP) grant. CEIP funded the Pender County survey because of the potential environmental impacts of peat mining and other energy-related development.

The recommendations made in this report by Steven W. Leonard and Richard J. Davis are advisory. Their inventory and recommendations are designed to help state and federal agencies, county officials, resource managers, landowners and developers work out effective land management and preservation mechanisms to protect the ten outstanding or exemplary natural areas described in this report. Agencies such as the N.C. Division of Environmental Management, Division of Land Resources, Division of Marine Fisheries, Wildlife Resources Commission, the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, and Environmental Protection Agency should find this report useful, as may university researchers, private consultants, and private conservation groups. The Office of Coastal Management will use the report in assessing permit applications and for federal and state consistency reviews.

Steven Leonard and Richard Davis are experienced field biologists, with intimate familiarity with the ecological resources of the project region. The investigators were exceptionally well qualified to identify, describe, and evaluate the most outstanding natural areas of the project region.

Project investigators were instructed to identify natural areas that contain highly unique, endangered, or rare natural features, or high-quality representations of relatively undisturbed natural habitats, and which may be vulnerable to threats and damage from land use changes. Consequently, the investigators were advised not to report extensively on the large expanses of brackish and salt marshes, that fringe most of the county's shoreline, and which, for the most part, are ecosystems protected through state and federal regulatory programs.


The Office of Coastal Management, and the Coastal Resources Commission which it serves, implement the Coastal Area Management Act of 1974 (CAMA). Under this statute, the North Carolina Coastal Management Plan has been prepared and approved. It includes the definition and designation of various Areas of Environmental Concern (AEC). In some cases, AECs coincide with natural areas that are herein recommended for preservation or special management. In some cases, AECs may encompass other areas--such as marsh zone wetlands--which are not extensively treated in this inventory.

Peat mining has particular implications for these natural areas, some of which overlay exploitable peat deposits. Mining will remove natural vegetation, permanently alter the hydrology of the region, lower surface soil types from high organic histosols to the clayey, sandy, and loamy soils typical of other parts of the outer coastal plain. Thus, natural communities, once mining is complete, almost certainly could never be re-established or reclaimed on mined-out land. Preservation of the best natural areas, and appropriate hydrological management, is necessary prior to and during active peat mining.

The Natural Heritage Program is most pleased to have had this opportunity to conduct this project for the Office of Coastal Management. The inventory has revealed a number of high quality natural areas that possess natural elements of statewide priority and are important parts of North Carolina's natural diversity. Most of the identified sites were previously unknown and undocumented by the state's scientific community. The Natural Heritage Program hopes that these areas will be protected for the benefits of present and future generations of North Carolinians and for the preservation of the state's truly exceptional natural heritage.

Charles E. Roe, Coordinator
N.C. Natural Heritage Program
November 17, 1982

Abstract. Ten natural areas are described and delineated for Pender County as a result of a field survey during May - October 1981. The natural areas contain slightly more than 101,000 acres and at least 104 significant features. The largest percentage of natural area lands (67 percent) is managed by the NC Wildlife Resources Commission. A large fraction of the remaining natural area acreage is comprised of river swamp. Only a small percentage of natural area acreage is non-wetland. Of those areas inventoried, the least satisfactory survey was performed on possibly the most significant natural area in the county-- Angola Bay-- where conventional methods of field analysis are nearly impossible to perform. Several promising natural areas were also discovered, but due to various constraints, were not examined adequately. These sites occur mostly along the Cape Fear River, the upper section of the Northeast Cape Fear River, Holly Shelter Creek sub-basin, Penderlea Game Lands, and the "Mooretown ponds". Research is continuing on the flora associated with the Invershiel-Meggett soil association near Maple Hill, and a composite "Birds of Pender County" is planned.



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INTRODUCTION

Seventh in size in North Carolina, Pender County has an area of 869 sq mi including 857 sq mi of land and 12 sq mi of water. The approximately 550,000 ac in the county consist of forest and forested wetlands (81%), agriculture (11%), developed (2%), water and marshlands (1%) and other miscellaneous land uses (5%).

Pender County is the newest county in eastern North Carolina of those bordering the Atlantic Ocean. The county was formed in 1875 from New Hanover, and in addition to the Atlantic Ocean and New Hanover County, it has contiguous boundaries with the following counties: Brunswick, Columbus, Bladen, Sampson, Duplin, and Onslow (FIGURE 1).

Three major rivers lie partly within the county. The most extensive river mileage is from the Northeast Cape Fear, followed by the Black River, and the Cape Fear River. All three rivers are navigable for lengthy distances, although the upper stretches of the Black River during periods of dry weather can only be safely navigated with small outboard or canoe. Several of the tributary streams which empty into the rivers are also navigable. Major tributary streams of the Northeast Cape Fear River are (in Pender County): Long Creek, Turkey Creek, Island Creek, Harrison/Merrick Creeks, Burgaw Creek, and Holly Shelter Creek. Moores Creek is the largest sub-basin in Pender County which empties into the Black River. There are no major Pender County drainages, other than Black River, which, in Pender, enter the Cape Fear. Nevertheless, the entire county lies within the Cape Fear Basin.

The generalized geology of Pender County dates from the Cretaceous Period, during which time the Pee Dee formation, consisting of gray-to-green sands, impure limestones, and lenses of marine clays and interbedded sands, was deposited. This formation is considered the basement complex beneath the western half of the county. East of the Pee Dee formation and extending in a belt from the Rocky Point area northeast to Maple Hill is Eocene Castle Hayne limestone, a chalky-white, sandy-shell limestone or dense silicified gray limestone. Outcrops of this formation are uncommon but do occur on the McRae Farm, east of Rocky Point. The formation is in significant quantities to make commercial exploitation feasible. The overburden varies considerably, as does the consistency of the stone. Near Maple Hill, the proximity of the Castle Hayne formation to the surface is sufficient to strongly alter soil pH. As a result the basic soil reaction affects vegetation and promotes atypical coastal plain communities. East of the Castle Hayne formation is a broad belt of mostly Quaternary sands and clays, a belt that is roughly delineated by the present route of US 17.

Soils of Pender County are diverse, and the preliminary soil map of the county shows ten soil series:

- (1) Johnston-Lumbree Association: Very poorly to poorly drained soils with loamy subsoils, on first bottom floodplains and low-lying stream terraces.

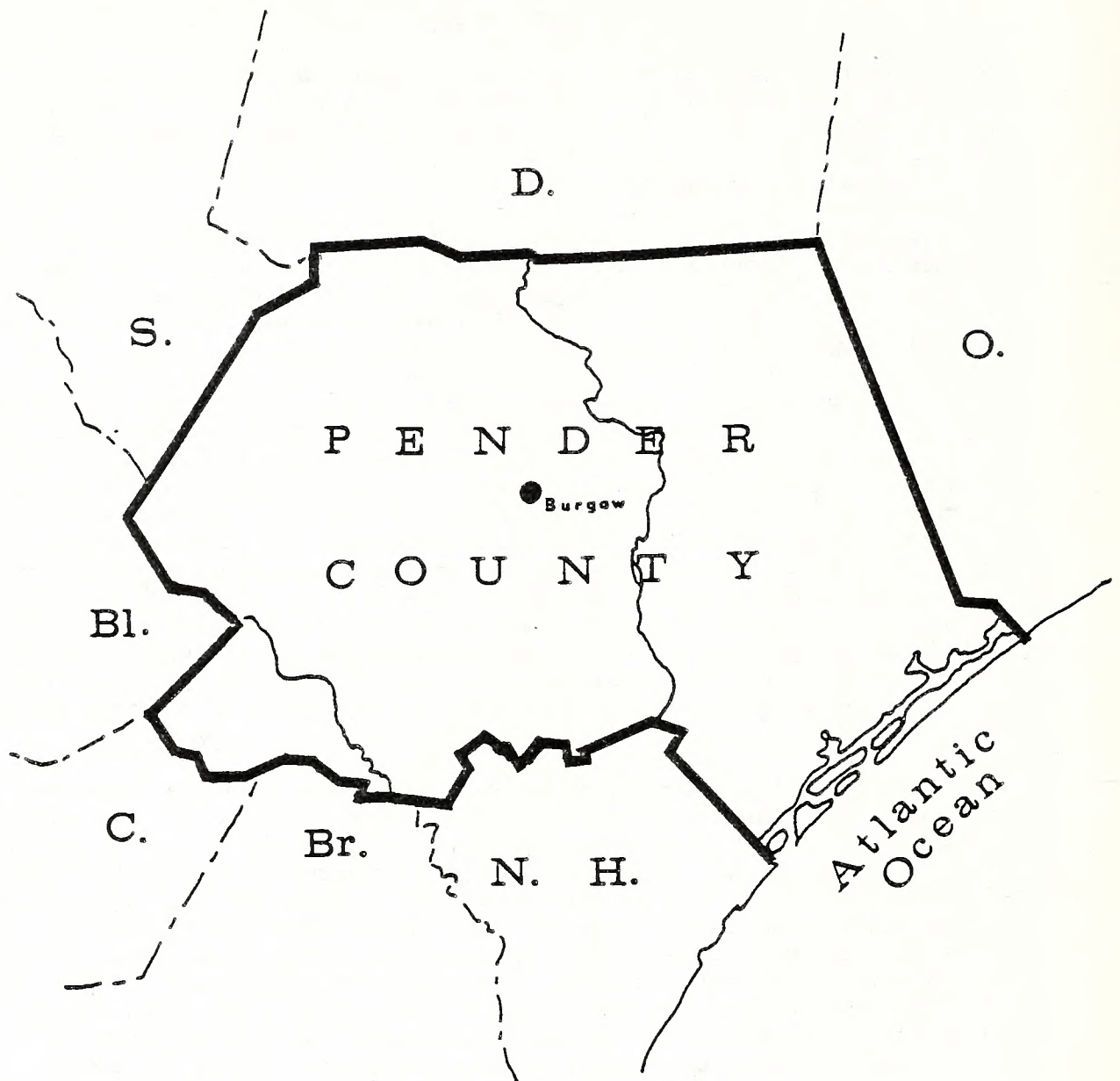


FIGURE 1. Pender County and surrounding features: Atlantic Ocean, and the Counties of New Hanover (N. H.), Brunswick (Br.), Columbus (C.), Bladen (Bl.), Sampson (S.), Duplin (D.), and Onslow (O.).

- (2) Dorovan-Ponzer Association: Very poorly drained soils with organic surfaces and sandy to loamy subsoils occurring in upland bays and in flood plains of tributaries of major streams.
- (3) Barclay-Pasquotank-Weeksville Association: Somewhat poorly drained to very poorly drained soils with silty surface layers and silty subsoils on level to nearly level low broad flats.
- (4) Bladen-Lumbee-Craven Association: Poorly drained to moderately well drained soils with clayey to loamy subsoils on level to gently sloped uplands and broad low-lying stream terrace areas.
- (5) Lumbee-Johns-Kalmia Association: Well drained to poorly drained soils with loamy subsoils on level to gently sloping stream terraces in the coastal plain.
- (6) Capers-Newhan Association: Very poorly drained to excessively drained, sandy to clayey, marsh and coastal dune soils on tidal flats and gently sloping areas near beaches and waterways along the coast subject to tidal flooding.
- (7) Lynn Haven-Leon-Kureb Association: Poorly drained to excessively well drained sandy soils with spodic horizons in the subsoil on broad low flats and sloping ridges in the coastal plain.
- (8) Invershiel-Meggett Association: Well drained to poorly drained soils that have loamy subsoils underlain by marl on lower marine terraces, stream terraces, and first bottom.
- (9) Wehadkee-Chewacla Association: Poorly drained to somewhat poorly drained soils with friable loamy subsoils on nearly level first bottom flood plains.
- (10) Portsmouth-Wakulla Association: Very poorly drained to excessively drained soils that have friable loamy to sandy subsoils on nearly level stream terraces and gently sloping broad upland ridges.

Vegetation and land use in Pender County are similar to that of adjacent counties. Non-forested lands occur throughout the county and include many types of vegetation cover: agriculture, abandoned fields, developed lands, open water, tidal marshes, barrier islands and beaches. Forested lands are predominantly mixed pine, and depending upon site characteristics may be longleaf pine, loblolly pine, slash pine, or pond pine. Bottomlands which are forested are usually covered with cypress, either in relatively pure stands, or more typically in mixed associations with water tupelo, red maple, black gum, sweetgum, or other hardwood species. Tidal influence is felt in the lower stretches of the Northeast Cape Fear and Black Rivers and through all of the Pender portion of the Cape Fear River. Brackish water wedges move upstream in the lower Northeast Cape Fear system, and freshwater to slightly brackish water marshes are occasionally seen along the shoreline. Carolina bay pocosins are not prevalent in Pender County as they are in Bladen and parts of Brunswick, Columbus, and Sampson. However, they do occur, and some of them have been drained for blueberry culture. By far the largest extent of pocosin (and possibly the most significant natural features on the county) are the joint embayments of Angola Bay and Holly Shelter Bay. Minor variations in terms of total county acreage of forests

are found near Rocky Point where a mixed hardwood composition stands out in contrast to the typical loblolly or pond pine forest, and to lesser extent, the red cedar woodlands along the mainland fringe adjacent to the tidal marshes. In the latter case, these woodlands are found on calcareous substrates-- Indian middens, or more recently, dredged material islands along the Atlantic Intracoastal Waterway. Except for the coastal and corridor development along US 17, vegetation and land use in Pender County may be visualized as a giant "V", in which the arms of the "V" are comprised of swamps and woodlands along the Cape Fear/Black System to the left and the Northeast Cape Fear/Angola-Holly Shelter Bays System to the right, and separated by a broad wedge-shaped agricultural area.

To inventory these diverse habitats for natural areas and endangered and threatened species first necessitated a county-wide reconnaissance. In late April, 1981 a rapid inspection of the county from as many of the secondary and primary roads as possible was undertaken. Brief side trips, consisting of walks of a few hundred yards were taken at selected points, often in creek bottoms, or in upland woods. Secondly, a planned survey of localities which had previously been recorded by Natural Heritage personnel and provided to us in the format of computer printout of known stations for endangered/threatened species, or unique biotic communities was performed. Thirdly, a survey of bottomlands, marshes, and the barrier islands was conducted by boat. As a tentative list of potential natural areas began to emerge, aerial inspection was completed. Altogether, the Pender County Natural Areas Inventory included 49 field days: 38 by ground, 9 by water, and 2 by air. Road mileage totalled slightly less than 3,700 mi.

The inventory results reflect a bias toward occurrences of endangered species and large areas of contiguous undisturbed lands. Perhaps the chief fault of the study is that it was too broad-- that more attention should have been focused on specific areas or types of areas. A glaring shortcoming is that certain areas are biologically significant, but as a result of constraints of this contract, may have unintentionally been excluded. Therefore, we wish to point out the following areas in need of further investigation:

- (1) Cape Fear River Swamp of Brunswick, Columbus, and Pender Counties
- (2) Roan Island
- (3) Larkins Cypress Grove, Bladen and Pender Counties (This remarkable cypress stand of old-growth trees was found late in the study. It is possibly the oldest extant timber stand in Pender County. Buttresses of trees are sometimes 15-20 ft thick; DBH, or diameter above the buttress enlargement is usually 3 ft, but on some individuals reaches 6-8 ft.)
- (4) Penderlea Game Lands
- (5) Mooretown Ponds, an area of sinkholes north of Northeast Cape Fear River
- (6) Holly Shelter savannas
- (7) Saltmarshes
- (8) Angola Bay, Pender and Duplin Counties
- (9) Maple Hill area

We have identified ten significant natural areas that vary in size from about 200 ac to almost 50,000 ac. These ten candidates are representative of several edaphic and biotic combinations. They range from xeric to hydric; from acidic to basic; from sea level to more than 70 ft in elevation; from biologically undisturbed to man-dominated. Some of the areas contain several populations of endangered and threatened species. The decision as to which areas to include and which areas to exclude was largely subjective, but did include objective elements. Typical questions that we considered when examining a potential site were

- (1) Does the site have regional, state, or county-wide uniqueness?
- (2) Are there unusual habitat conditions present?
- (3) Are there endangered, threatened, or rare species present?
- (4) Is the site representative of a type of habitat which is rapidly being converted to other land uses?
- (5) Does the site have protective, management, or habitat enhancement status?
- (6) Would loss of the habitat constitute an irretrievable loss of resource to Pender County?
- (7) Is natural area designation congruent with the activities and land use intentions of the landowner(s)?

From our own observations of land use activity in the county, and from discussion with officials and landowners, we saw and learned of a few activities which lack provision for biological enhancement. Landowner education on the benefits of a regular controlled-burn program and voluntary implementation would reduce the risks of catastrophic forest fire. Establishment of hedgerows, wildlife food plots, and a crop rotation sequence with food and cover during critical nesting times would greatly benefit wildlife, and should be incorporated into large agricultural enterprises. Consideration of natural flora and fauna, as well as potential impact on wetland systems should be given prominence in development plans for industry. Piecemeal residential development in which maximum numbers of units are placed on minimum acreage should be evaluated with extreme care. Future land use trends and the consequences of estuarine deterioration on finfish and shellfish in Pender waters should be assessed for long term as well as short term effects.

Two natural areas in the county are located in proximity to limestone mines, and therefore, are potentially threatened by mining activity. Two natural areas are located along major highway corridors (I-40, under construction and US 421) and may be affected by industrial development. One natural area is subject to beach residential development.

On the other hand, three natural areas are already afforded protective status, and two others, comprised predominantly of swamp lands are unlikely to be drastically altered. In terms of acreage, the overwhelming percentage of natural area lands in Pender County is now protected under the jurisdiction of the NC Wildlife Resources Commission.

From this brief inventory of the natural features and resources of Pender County, we were very impressed-- by their diversity and by their quality. The natural heritage of Pender County is one of which all North Carolinians can be justly proud.

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Angola Bay, Holly Shelter Bay
2. County: Pender
3. Location: Angola Bay is located in the northeast part of Pender County, east of US 117 and the Northeast Cape Fear River, and extends into southern Duplin County. Holly Shelter Bay is located in east-central Pender County, south of NC 53, east of the Northeast Cape Fear River, and northwest of US 17. Coordinates: Angola Bay: Vicinity of 34°40'N, 77°50'W; Holly Shelter Bay: Vicinity of 34°30'N, 77°40'W. (FIGURES 2,3).
4. Topographic Quadrangle(s): Angola Bay: Burgaw (1942) and Maple Hill (1943); Holly Shelter Bay: Complete in 7.5' maps except for Folkstone and including parts of Stag Park (1981), Maple Hill SW (1981), Mooretown (1970), Topsail (1970), and Holly Ridge (1970).
5. Size: Approximately 20,000 ac within the Pender County portion of Angola Bay Game Land, and 48,500 ac within the Holly Shelter Wildlife Management Area.
6. Elevation: 15 ft or slightly less to 30 ft above mean sea level
7. Access: Angola Bay is inaccessible! The southern periphery can be reached by traveling northeast from Burgaw on NC 53 for approximately 8 miles. Private, gated roads extend northward but do not go as far as the State Game Land boundary. Holly Shelter Bay includes limited access from US 17, north of Hampstead and from SR 1520 which parallels the Northeast Cape Fear River. It is advisable, before entering Holly Shelter Bay, to acquaint oneself with pertinent regulations. Therefore, it is suggested that entrance to the natural area include a visit to the Game Lands headquarters on SR 1520, ca. 7 miles north of NC 210.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May-September, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: From the air, the two vast areas of Angola Bay and Holly Shelter Bay appear as limitless green wilderness. With diameters of more than 10 miles, and in the case of Angola Bay, no roads or trails, they rank with Dismal Swamp, the Dare County peninsula, the "open grounds" of Carteret County, and the Green Swamp as some of North Carolina's most inaccessible interior wetlands. For almost fifty years Angola and Holly Shelter have been owned by the State, and

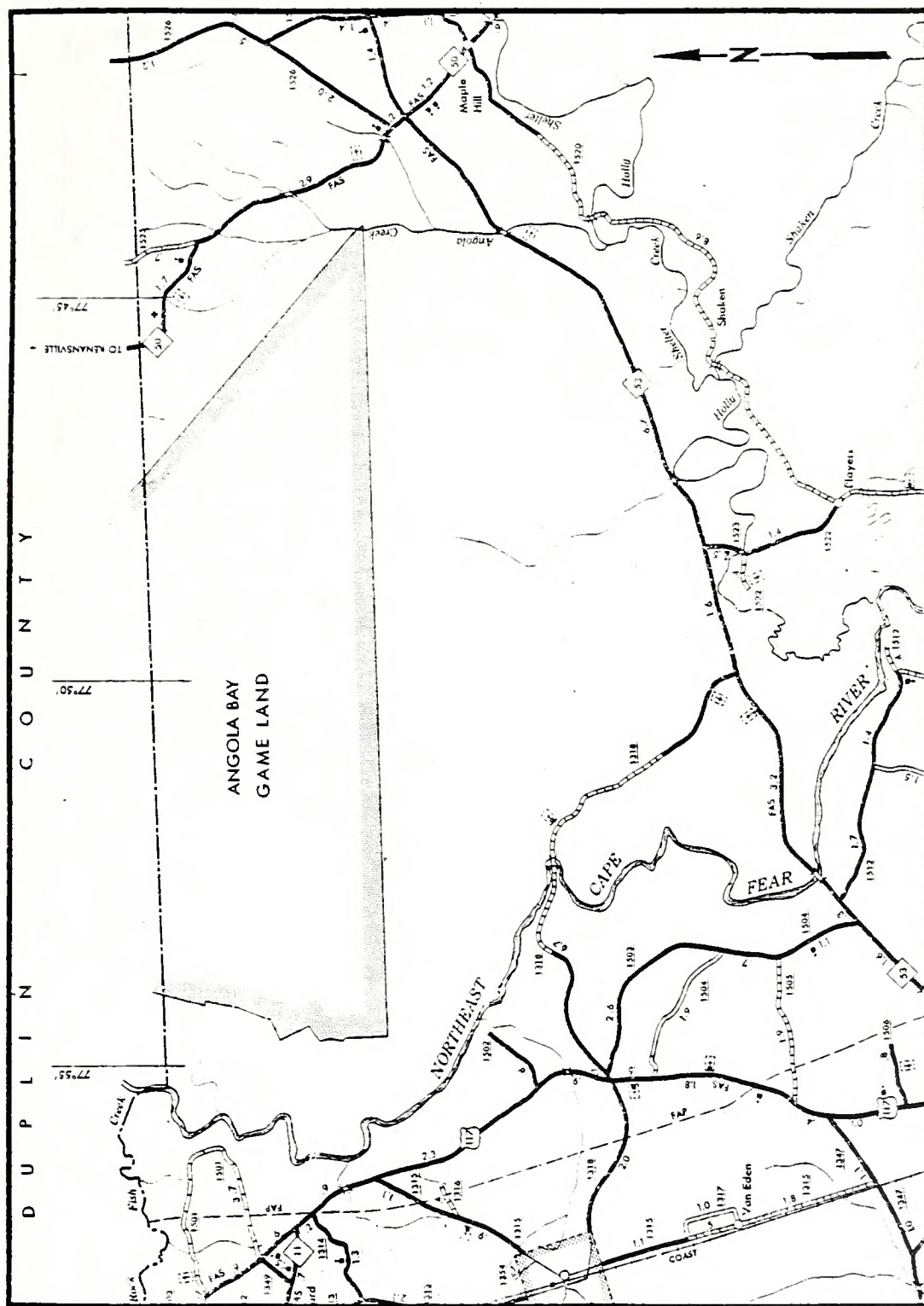


FIGURE 2. Angola Bay section of Angola Bay, Holly Shelter Bay Natural Area.

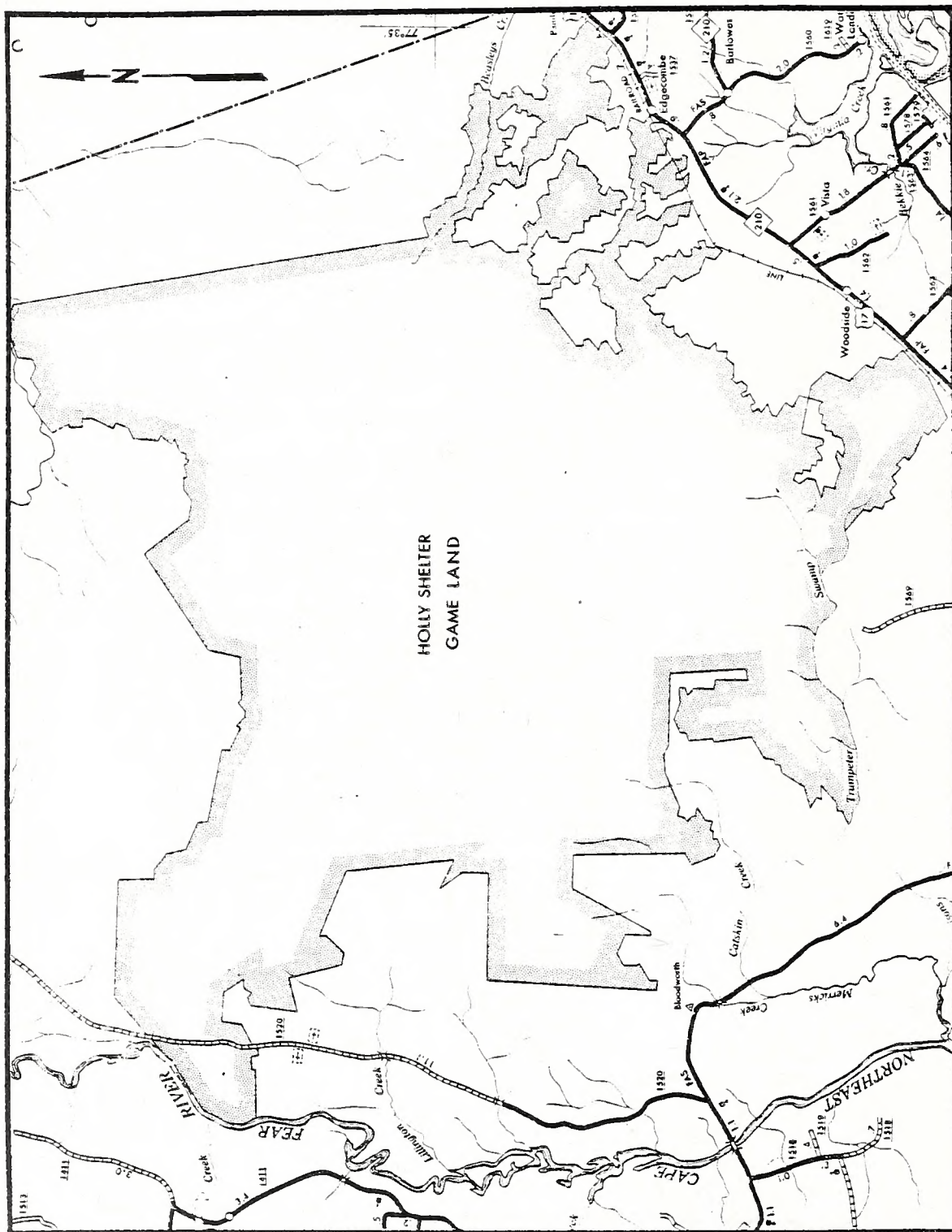


FIGURE 3. Holly Shelter Game Lands section of Angola Bay, Holly Shelter Bay Natural Area.

more recently, managed as wildlife preserves. Adjacent lands are often owned by timber companies which have attempted to replace the inferior forests of pond pine with other species.

The term "bay" is often used in reference to elliptic depressions known more completely as "Carolina bays;" however, the size, shape, and surrounding features of Angola and Holly Shelter suggest instead, a geomorphological origin as gigantic embayments. Close inspection of aerial photographs reveals that within these embayments are typical Carolina bay ellipses. Thus the origin of interior Carolina bays postdates the origin of Angola and Holly Shelter. Several sand ridges, ranging in elevation from a foot or two above the adjacent pocosin swamp to ten to fifteen feet, are located within the boundaries of the pocosin. In Angola Bay, not far from the Duplin County line, one such ridge is used as a Forest Service landing strip.

The history of the bay vegetation is closely linked to wildfires. Old photography occasionally shows fire scars-- darkened areas, or tracts of regrowth timber which differs markedly from nearby stands. Because of the impassibility of heavy machinery over the boggy soil, fire fighting is difficult, and may be restricted to aerial application of retardants. Historically, fires were allowed to burn and smoulder until rains or soil moisture eventually extinguished them. Thus the vegetation has changed during the past century as a combination of factors-- fire prevention, drainage, natural succession-- have all interacted to give the ecological conditions observed today.

Vegetation of the bays differs, not so much in overall species composition, but in the relative acreage of communities. Angola Bay is, for the most part, a treeless or near-treeless expanse of evergreen shrubbery, with pond pines scattered here and there, or sometimes a localized zone of sweet bay or loblolly bay. The interior of Holly Shelter has much larger volumes of pond pine timber than Angola Bay, but it nevertheless does have a large treeless area in the northeastern part. The southeastern part of Holly Shelter, in what might be termed the "rim" contains higher-elevation sand and sandy clay, which is covered with longleaf pine that is periodically burned. As a result, the southeast quadrant of Holly Shelter has superlative longleaf pine savannas, which gradually dip toward the northwest into titi and bald cypress wetlands. The only known stand of Atlantic white cedar in either of the two bays occurs in Holly Shelter in the drainage basin of Trumpeter Swamp.

Wildlife in the bays enjoys the seclusion afforded by thousands of acres of pocosin. Black bear populations exist in both bays, and there is probably migration between the two bays. Deer are plentiful, and the Holly Shelter Game Lands provide hunters with bow and conventional firearm seasons. A large shallow waterfowl impoundment of approximately 200 acres has recently been constructed in Holly Shelter, and contains adult alligators as well as waterfowl. Water in the embayments is highly acidic, and hence, is not conducive to gamefish management.

An account of Holly Shelter as it appeared thirty-five years ago is found in B. W. Well's "Vegetation of Holly Shelter Wildlife Management Area"; N. C. Dept. Cons. and Dev., Div. Game and Inland Fisheries, Bulletin #2 (1946).

- 11B. Prose Description of Site Significance: Angola Bay and Holly Shelter Bay are unique landforms in North Carolina. They are large and biologically poorly known. Angola Bay, particularly, is in need of intensive study, but due to the formidable conditions of saturated soil, floating organic mats, dense shrubs, catbriers, areal expanse, black bears, venomous snakes, mosquitoes, ticks, and sultry weather, summertime study is unthinkable. Nevertheless, the work needs to be done.

That large portions of the two areas are protected and managed assures no immediate threats to the endangered species found within this natural area. Theft of insectivorous plants is a common problem along the eastern boundary of Holly Shelter, but we saw excellent populations of several species.

In summary, the significance of Angola Bay and Holly Shelter Bay is that (a) they are unique, (b) they are large, (c) they are not likely to be threatened, (d) they are owned by the State, (e) they are managed, and (f) they contain endangered plants and animals.

12. Significance Summary: (see TABLE 1)

Legal Status, Use and Management

13. Ownership type by percent area: Private 0%, Public 100%, but with restricted access, Unknown 0%
14. Number of Owners: 1
15. Name(s) of Owner(s) and/or Custodian(s) (with addresses, phone numbers, and other pertinent information): North Carolina Wildlife Resources Commission, Raleigh, NC
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Mr. Charles "Vic" French, Wildlife Management Technician II, Route 1, Box 222, Burgaw, NC 28425. Mr. French is Holly Shelter Game Lands Manager.
17. Attitude of Owner or Custodian Toward Preservation (contact?): Owner not contacted. It is locally rumored that Angola Bay has been considered for a land swap.
18. Uses of Natural Area: Angola Bay-- Game Preserve; Holly Shelter Game Lands-- Hunting, scientific research, minor amounts of nature study and observation by vacationers and regional residents.
19. Uses of Surrounding Land: Wildland 20%, Agricultural land 10%, High-intensity forestry 70%, Developed 0%

TABLE 1. Significance summary of Angola Bay, Holly Shelter Bay Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
High quality wetland community	1	Pond pine pocosin	The most extensive area of this community type in southeastern NC
High quality terrestrial community	2	Longleaf pine savanna	Extensive, well-managed, containing many rare spp.
Endangered or threatened sp.	3a	Venus' fly-trap	Large, vigorous populations
Endangered or threatened sp.	3b	Dwarf fothergilla	Scattered populations; some very large and vigorous
Endangered or threatened sp.	3c	Rough-leaf loosestrife	Extremely rare in county and in natural area
Endangered or threatened sp.	3d	Red-cockaded Woodpecker	Several breeding colonies known from natural area
Endangered or threatened sp.	3e	American Alligator	Three mature individuals and possibly several immature in area
Special concern species	4	Black bear	One or two populations; known from both bay areas
Outstanding geomorphology	5	Isolated embayments	Unique landform feature; this natural area possibly best examples in NC
Special management area	6	NC Game Lands/Preserve	Area owned by State and already protected

20. Preservation Status: Category 1, 100% Wildlife Preserve and Wildlife Management Area
21. Regulatory Protection in Force: Restricted access, regulated hunting, protection of exploited and endangered species, CAMA coastal wetlands, fragile areas, natural hazard areas.
22. Threats: Potential drop in water table from drainage of adjacent swamplands and pocosins. Peat utilization is a possible threat, but at this time, not probable.
23. Management and Preservation Recommendation: Controlled burning would reduce the wildfire hazard, upgrade wildlife habitat, and promote botanically diverse savanna development. We do not make management recommendations for Angola Bay until further study is conducted; in the interim, we strongly encourage minimal access, and no drainage, timber harvest, or wildlife food plot clearance.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:

Community type: Pinus serotina/Cyrilla racemiflora-Zenobia pulverulenta; peripheral stands of Pinus palustris/Aristida stricta; isolated examples of Taxodium distichum-Nyssa biflora
Community cover type: Predominantly Pinus serotina
General habitat feature: Pond pine pocosin
Average canopy height: 25 ft
Estimated age of canopy trees: 40-60 yrs
Canopy cover: Open
Estimated size of community: Total of 40,000 ac
Successional stage: Edaphic climax
Sere type: Hydrosere
Common canopy species in community cover or community type (but not dominant): None
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Gaylussacia frondosa, Lyonia lucida, Myrica cerifera, Ilex coriacea, Ilex glabra, Persea borbonia
Common herb stratum species in community cover or community type (but not dominant): Woodwardia virginica

24B. Soil Summary (by community type)

Soil series: Pamlico
Soil classification: Histosols; Typic Medihemists to Fibric Terric Medihemists
Soil association: Dorovan-Ponzer
pH class: acidic to extremely acidic
Moisture class: Very poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS (1972); Soil Taxonomy, Agri. Handbook # 436
Other notes: None

- 24C. Hydrology Summary (by community type)
 Hydrologic system: Palustrine
 Hydrologic subsystem: Aqueous
 Water chemistry: Fresh
 Water regime: Saturated to intermittently exposed
 Drainage class: Very poorly drained
 Drainage basin: Northeast Cape Fear River
 Hydrology characterization: A very poorly drained, saturated to intermittently exposed, freshwater palustrine system.
- 24D. Topography Summary
 Landform: Nearly circular marine embayments with drainage seaward blocked by Pleistocene sands
 Shelter: Deeply sheltered
 Aspect: not applicable
 Slope angle: not applicable
 Profile: Concave to flat
 Surface patterns: Smooth
 Position: not applicable
25. Physiographic Characterization of Natural Area: An edaphic climax community of a hydrosere which occupies a relict embayment which now drains into the Northeast Cape Fear River and situated in the Coastal Plain province of the Atlantic Plain.
 Geological Formation: Cretaceous Pee Dee formation and Eocene Castle Hayne formation overlain by Pleistocene to Recent sands
 Geological Formation age: Cretaceous formation: 60 million years; Eocene formation: 40-50 million years; Pleistocene to Recent: 1-3 million years to approximately 6 thousand years before present
26. Summary - Endangered and Threatened Species
 (1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
 Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
 Number of populations on site: 3 seen in Holly Shelter
 Number of individuals per population: 15 to 1,000
 Size or maturity of individuals: All stages
 Phenology of population: Vegetative: 60%; Flowering: 25%; Fruiting 15%
 General vigor of population: Vigorous
 Disturbance or threats to population: Harvesting by local residents; some enforcement by Holly Shelter Game Lands staff
 Habitat characteristics:
 Plant community: Longleaf pine savannas
 Topography: Level to gently sloping
 Soil series: Localized occurrence of Leon sand
 Microclimate: Not determined
 Drainage basin: Northeast Cape Fear River
 Other plant and animal species present: Aristida stricta, Vaccinium crassifolium, Polygala lutea, Polygala cruciata, Chaptalia tomentosa, Chrysopsis graminifolia; Whitetail deer (tracks)

(2) Name of species: Fothergilla gardenii (HAMAMELIDACEAE) Dwarf fothergilla

Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 100

Size or maturity of individuals: Mature

Phenology of population: Vegetative: 50%; Flowering 0%; Fruiting: 50%

General vigor of population: Vigorous

Disturbance or threats to population: None evident

Habitat characteristics:

Plant community: Ecotonal border of a black gum/gallberry drainage and a cutover longleaf pine savanna

Topography: 2% slope

Soil series: Lynn Haven

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: Plants: Ilex glabra, Myrica cerifera, Vaccinium atrococcum, Vaccinium crassifolium, Andropogon sp.

Animals: See attached master species lists.

(3) Name of species: Lysimachia asperulaefolia (PRIMULACEAE) Rough-leaf loosestrife

Species legal status and authority: NC endangered endemic (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 6

Size or maturity of population: Mature

Phenology of individuals: Vegetative: 66%; Flowering 33%; Fruiting 0%

General vigor of population: Fair

Disturbance or threats to population: Plants were found in a firebreak

Habitat characteristics:

Plant community: Ecotonal border between a longleaf pine savanna and a cypress/titi swamp

Topography: 2% slope

Soil series: Presumed to be Lynn Haven

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: Plants: Aristida stricta, Andropogon virginicus, Rhexia mariana, Rhexia alifanus, Polygala lutea, Lycopodium alopecuroides. Animals: See attached master species lists.

(4) Name of species: Red-cockaded Woodpecker

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations on site: Reported by Holly Shelter Game Lands personnel to be around 14 within Holly Shelter; not determined for Angola Bay

Number of individuals per population: 1 to ca. 10

Size or maturity of individuals: Breeding populations present

Phenology of population: Not applicable

General vigor of population: Not determined

Disturbance or threats to population: In cases where birds are using pond pines for cavity trees, growth of understory, lightning strikes, and natural demise of trees are causing disturbance, but on the whole sufficient habitat remains for a stable population to thrive.

Habitat characteristics:

Plant community: Primary community is longleaf pine; secondary community is pond pine

Topography: Usually level or nearly so

Soil series: Leon sand to Pamlico muck

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: See attached master species lists.

(5) Name of species: American Alligator

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations on site: At least 1

Number of individuals: Three or more

Size or maturity of individuals: Mature

Phenology of population: Not applicable

General vigor of population: Good

Disturbance or threats to population: None

Habitat characteristics: Animals were found in a deep canal within an artificial impoundment for waterfowl. This impoundment, when permanently flooded will significantly increase the habitat acreage and improve the habitat quality.

(6) Name of species: Black bear

Species legal status and authority: NC special concern (Cooper et al. 1977)

Number of populations on site: 1, possibly 2

Number of individuals: Thought to be around 35

Size or maturity of individuals: Breeding population(s)

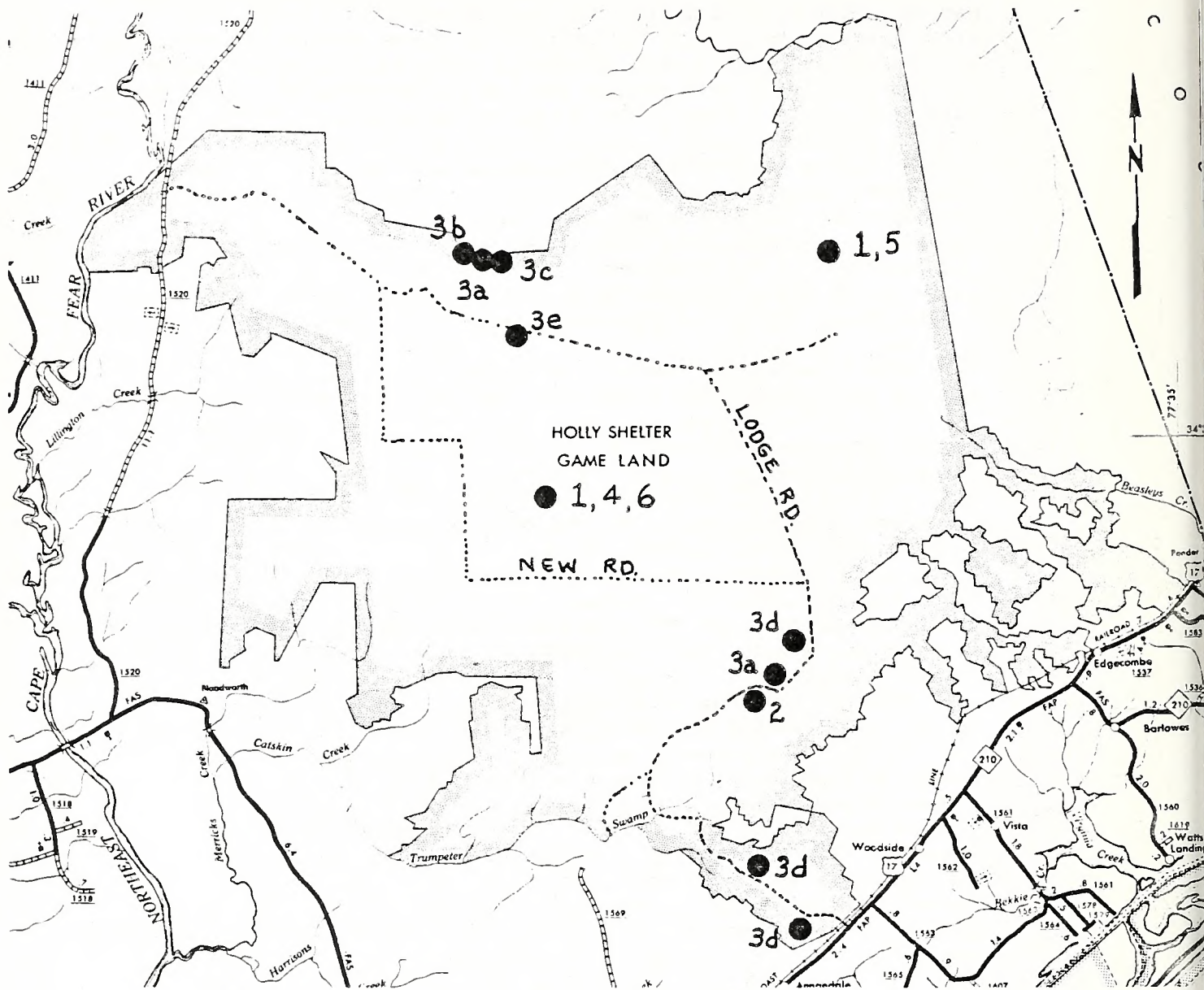
Phenology of population: Not applicable

General vigor of population: Good

Disturbance or threats to population: None

Habitat characteristics: Animals are wide-ranging and use a variety of habitats.

(See FIGURE 4 for detailed map of endangered and threatened species locations.)



27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE

Acer rubrum

AMARYLLIDACEAE

Hypoxis hirsuta

H. hirsuta var. *leptocarpa*

H. micrantha

ANACARDIACEAE

Rhus radicans

R. vernix

APIACEAE

Centella asiatica

Eryngium integrifolium

E. yuccifolium

Hydrocotyle umbellata

Oxypolis filiformis

O. ternata

AQUIFOLIACEAE

Ilex coriacea

I. glabra

I. opaca

ASCLEPIADACEAE

Asclepias humistrata

A. lanceolata

ASPIDIACEAE

Thelypteris palustris

ASTERACEAE

Aster tortifolius

A. linariifolius

Carduus repandus

C. spinosissimus

Carphephorus bellidifolius

C. tomentosus

Chaptalia tomentosa

Chrysopsis gossypina

C. graminifolia

Chondrophora nudata

Coreopsis angustifolia

C. basalis

C. falcata

C. tinctoria

Elephantopus nudatus

Erigeron vernus

Eupatorium album

E. capillifolium

E. leucolepis

E. perfoliatum

Eupatorium pilosum
 E. recurvans
 E. rotundifolium
 E. serotinum
 Euthamia tenuifolia
 Haplopappus divaricatus
 Helianthus atrorubens
 H. heterophyllus
 Liatris graminifolia
 Marshallia graminifolia
 Mikania scandens
 Pterocaulon pycnostachyum
 Pyrrhopappus carolinianus
 Solidago odora
 S. stricta
 Trilisa paniculata
 BLECHNACEAE
 Woodwardia areolata
 W. virginica
 BROMELIACEAE
 Tillandsia usneoides
 BURMANNIACEAE
 Burmanna capitata
 CAMPANULACEAE
 Lobelia elongata
 L. glandulosa
 L. nuttallii
 L. puberula
 CAPRIFOLIACEAE
 Lonicera sempervirens
 Viburnum nudum
 CISTACEAE
 Lechea leggettii
 CLETHRACEAE
 Clethra alnifolia
 CONVOLVULACEAE
 Bonamia patens var. angustifolia
 CUPRESSACEAE
 Chamaecyparis thyoides
 CYPERACEAE
 Carex crinita
 C. walteriana
 Dichromena latifolia
 Eleocharis obtusa
 Fimbristylis autumnalis
 Fuirena squarrosa
 Psilocarya nitens
 Rhynchospora cephalantha
 R. chapmanii
 R. pallida
 R. torreyana

Scleria pauciflora
S. reticularis
S. triglomerata
 CYRILLACEAE
Cyrilla racemiflora
 DIONAEACEAE
Dionaea muscipula
 DROSERACEAE
Drosera brevifolia
D. capillaris
D. intermedia
 ERICACEAE
Cassandra calyculata
Gaylussacia dumosa
G. frondosa
Kalmia angustifolia var. *caroliniana*
Leucothoe axillaris
L. racemosa
Lyonia ligustrina
L. lucida
L. mariana
Rhododendron atlanticum
R. viscosum
Vaccinium atrovirens
V. corymbosum
V. crassifolium
V. elliotii
V. stamineum
V. tenellum
Zenobia pulverulenta
 ERIOCAULACEAE
Eriocaulon compressum
E. decangulare
Lachnocaulon anceps
 EUPHORBIACEAE
Cnidoscolus stimulosus
Euphorbia curtisii
 FABACEAE
Amorpha herbacea
Baptisia cinerea
B. tinctoria
Galactia regularis
Indigofera caroliniana
Lespedeza capitata
L. hirta
L. repens
L. steuvei
L. virginica
Rhynchosia difformis
Tephrosia spicata
Zornia bracteata

FAGACEAE

Castanea pumila
Quercus incana
Q. laevis
Q. margaretta
Q. marilandica
Q. pumila
Q. virginiana

GENTIANACEAE

Sabatia campanulata
S. stellaris

HAEMODORACEAE

Lachnanthes caroliniana

HAMAMELIDACEAE

Fothergilla gardenii
Liquidambar styraciflua

HYPERICACEAE

Hypericum gentianoides
H. hypericoides
H. reductum
H. stans
H. walteri

IRIDACEAE

Sisyrinchium mucronatum var. atlanticum

JUNCACEAE

Juncus coriaceus
J. repens

LAMIACEAE

Hyptis alata
Pycnanthemum flexuosum
Scutellaria integrifolia

LAURACEAE

Persea borbonia

LENTIBULARIACEAE

Pinguicula caerulea
P. lutea
Utricularia subulata

LILIACEAE

Aletris farinosa
Melanthium virginicum
Pleea tenuifolia
Smilax laurifolia
Tofieldia racemosa
Zigadenus densus
Z. glaberrimus

LOGANIACEAE

Gelsemium sempervirens
Mitreola petiolata
Polyprenum procumbens

LORANTHACEAE

Phoradendron serotinum

LYCOPODIACEAE
 Lycopodium alopecuroides
 L. appressum
 L. carolinianum
 MAGNOLIACEAE
 Liriodendron tulipifera
 Magnolia virginiana
 MELASTOMATACEAE
 Rhexia alifanus
 R. lutea
 R. mariana
 R. petiolata
 MYRICACEAE
 Myrica cerifera
 M. cerifera var. *pumila*
 M. heterophylla
 NYSSACEAE
 Nyssa biflora
 ONAGRACEAE
 Ludwigia palustris
 Oenothera laciniata
 ORCHIDACEAE
 Calopogon pallidus
 C. pulchellus
 Cleisthes divaricata
 Habenaria blephariglottis
 H. ciliaris
 H. cristata
 H. nivea
 Pogonia ophioglossoides
 Spiranthes cernua
 S. praecox
 S. vernalis
 OSMUNDACEAE
 Osmunda cinnamomea
 O. regalis var. *spectabilis*
 PINACEAE
 Pinus palustris
 P. serotina
 P. taeda
 POACEAE
 Andropogon gerardi
 A. scoparius
 A. ternarius
 A. virginicus
 Anthraenantia rufa
 Aristida purpurascens
 A. stricta
 Arundinaria gigantea
 Leptoloma cognatum

Muhlenbergia capillaris
 Panicum angustifolium
 P. commutatum
 P. dichotomum
 P. laxiflorum
 P. scoparium
 P. tenue
 Paspalum dilatatum
 P. praecox
 Triplasis purpurea
 POLYGALACEAE
 Polygala cruciata
 P. cymosa
 P. hookeri
 P. lutea
 P. mariana
 P. ramosa
 POLYPODIACEAE
 Polypodium polypodioides
 PRIMULACEAE
 Lysimachia asperulaefolia
 L. loomsii
 PTERIDACEAE
 Pteridium aquilinum
 ROSACEAE
 Amelanchier canadensis
 A. obovalis
 Rosa palustris
 Rubus trivialis
 Sorbus arbutifolia
 SARRACENIACEAE
 Sarracenia flava
 S. purpurea
 SAXIFRAGACEAE
 Itea virginica
 SCROPHYLARIACEAE
 Agalinis purpurea
 A. setacea
 Penstemon australis
 Seymeria cassioides
 SOLANACEAE
 Physalis angulata
 TAXODIACEAE
 Taxodium distichum
 THEACEAE
 Gordonia lasianthus
 VIOLACEAE
 Viola lanceolata
 VITACEAE
 Vitis rotundifolia

XYRIDACEAE

Xyris ambigua
X. baldwiniana
X. caroliniana
X. difformis
X. platylepis

AMPHIBIANS

Broken-striped Newt
Slimy Salamander
Southern Toad
Oak Toad
Southern Cricket Frog
Squirrel Treefrog
Little Grass Frog
Southern Leopard Frog

REPTILES

American Alligator
Eastern Mud Turtle
Eastern Box Turtle
Spotted Turtle
Yellow-bellied Turtle
Snapping Turtle
Eastern Glass Lizard
Green Anole
Ground Skink
Black Racer
Corn Snake

BIRDS

Key

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Green Heron	SV
Great Blue Heron	PV
Wood Duck	PR*
Turkey Vulture	PR
Black Vulture	PR
Red-tailed Hawk	PR*
Red-shouldered Hawk	PR*

American Kestrel	WR
Bobwhite	PR*
Spotted Sandpiper	T
Solitary Sandpiper	T
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Chimney Swift	SR*
Ruby-throated Hummingbird	SV
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-cockaded Woodpecker	PR*
Red-bellied Woodpecker	PR*
Red-headed Woodpecker	PR*
Downy Woodpecker	PR*
Eastern Kingbird	SR*
Great Crested Flycatcher	SR*
Eastern Phoebe	WR
Acadian Flycatcher	SV
Eastern Wood Pewee	SV*
Rough-winged Swallow	T
Barn Swallow	SV
Purple Martin	SV
Blue Jay	PR*
Common Crow	PR*
Fish Crow	PR*
Carolina Chickadee	PR*
Tufted Titmouse	PR*
White-breasted Nuthatch	PV
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
Brown Thrasher	PR*
American Robin	PV
Wood Thrush	SV
Eastern Bluebird	PR*
Blue-gray Gnatcatcher	SR*
Cedar Waxwing	WR
Starling	PV
White-eyed Vireo	SR*
Yellow-throated Vireo	SV
Red-eyed Vireo	SV
Black-and-white Warbler	T
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Worm-eating Warbler	SR*
Northern Parula Warbler	SR*
Yellow Warbler	T
Black-throated Blue Warbler	T
Yellow-rumped Warbler	WR
Yellow-throated Warbler	SR*

Pine Warbler	PR*
Prairie Warbler	SR*
Ovenbird	T
Northern Waterthrush	T
Common Yellowthroat	PR*
Yellow-breasted Chat	SR*
Hooded Warbler	SR*
Eastern Meadowlark	PR*
Red-winged Blackbird	PV
Orchard Oriole	SR*
Common Grackle	SR*
Brown-headed Cowbird	SR*
Scarlet Tanager	T
Summer Tanager	SR*
Cardinal	PR*
Blue Grosbeak	SR*
Indigo Bunting	SR*
Pine Siskin	WV
American Goldfinch	WR
Rufous-sided Towhee	PR*
Chipping Sparrow	WR
Field Sparrow	WR
White-throated Sparrow	WR
Swamp Sparrow	WR

MAMMALS

Eastern Mole
 Black Bear
 Raccoon
 Mink
 Fox
 Bobcat
 Eastern Cottontail
 Marsh Rabbit
 Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Northeast Cape Fear River
2. County: Pender (with parts of Island Creek in New Hanover)
3. Location: From the New Hanover County line, east of US 421 near 34°20'N, 78°00'W upstream and including portions of Holly Shelter Creek to a point about 2 miles downstream from the NC 53 bridge near 34°35'N, 77°50'W. This natural area is about 40 river miles long. (FIGURES 5, 6).
4. Topographic Quadrangle(s): Castle Hayne (1970), Rocky Point (1970), Scotts Hill (1970), Mooretown (1970), Stag Park (1981)
5. Size: 13,800 ac (est.)
6. Elevation: 3 ft to 6 ft above mean sea level, occasionally including higher bluffs adjacent to the river.
7. Access: Boat access points are Cowpens Landing at the end of SR 1428 (private, open to the public for fee), Clarks Landing on Long Creek at the end of SR 1408, Wildlife Resources Commission landing at US 117 bridge, Lanes Ferry landing at NC 210 bridge, Wildlife Resources Commission landing near Holly Shelter Game Lands headquarters, and Wildlife Resources Commission landing at White Stocking at the end of SR 1512.
8. Names of Investigators: S. W. Leonard Ricky Davis
 P. O. Box 3475 126 Duncansby Court
 Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May through September, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: Black-water rivers in North Carolina are rare, and among the most pristine is the Northeast Cape Fear. The riverside development of industry which is present along the lower reach of the river in New Hanover County is absent from Pender County. The uppermost industry along the river is located near Castle Hayne and consists of Ideal Cement and Diamond Shamrock-- industries which utilize the Castle Hayne limestone, which rarely crops out along the river's bank. Residential development tends to be clustered at but two places-- Castle Hayne and Stag Park.

The river itself winds through a mixed forest of predominantly bald cypress and black gum, occasionally with high bluffs where loblolly pine may be seen. The woods are draped with Spanish moss, and birds

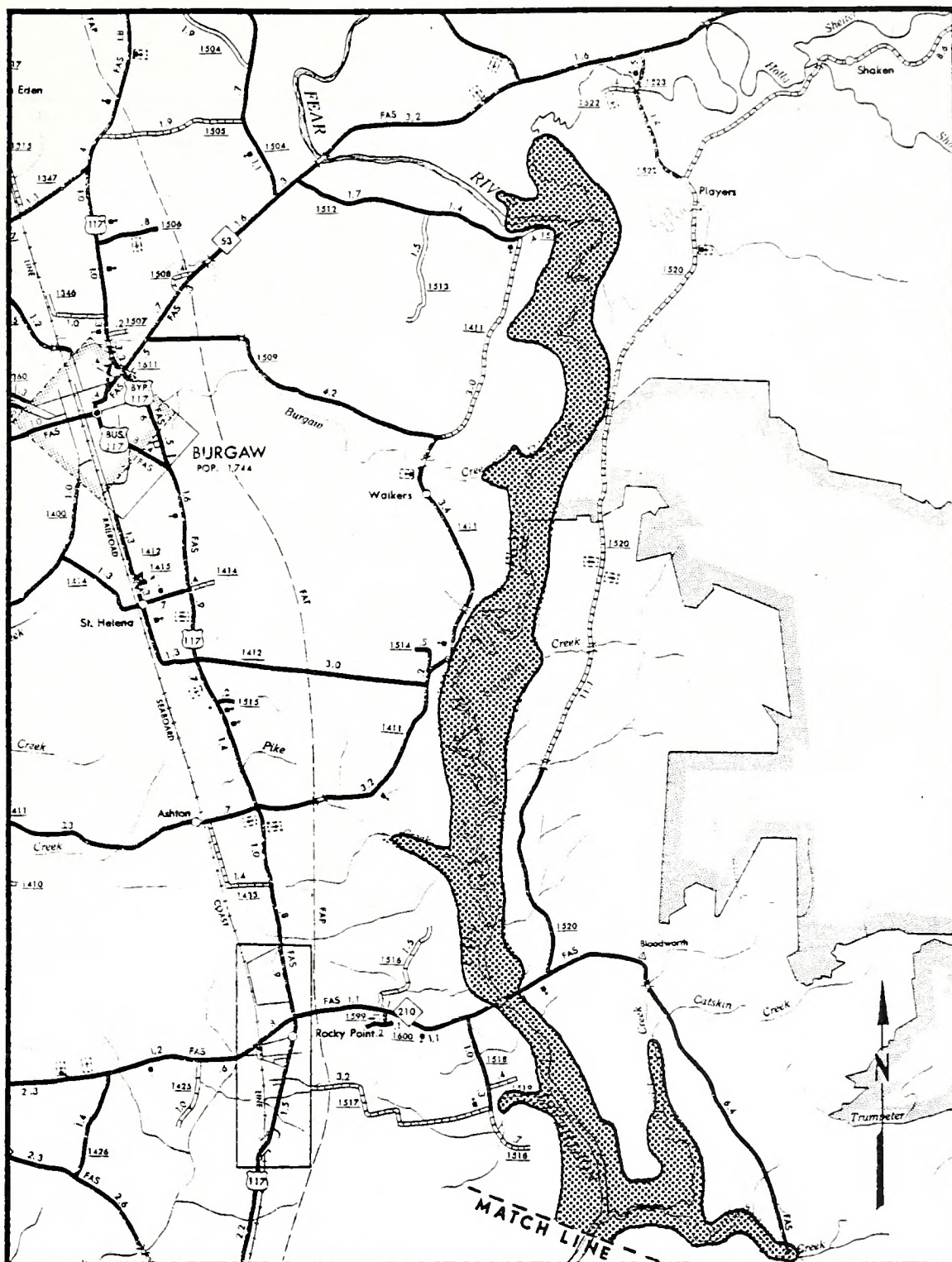


FIGURE 5. Northeast Cape Fear River Natural Area (north section).
Map scale: 1 in. = 2 mi.

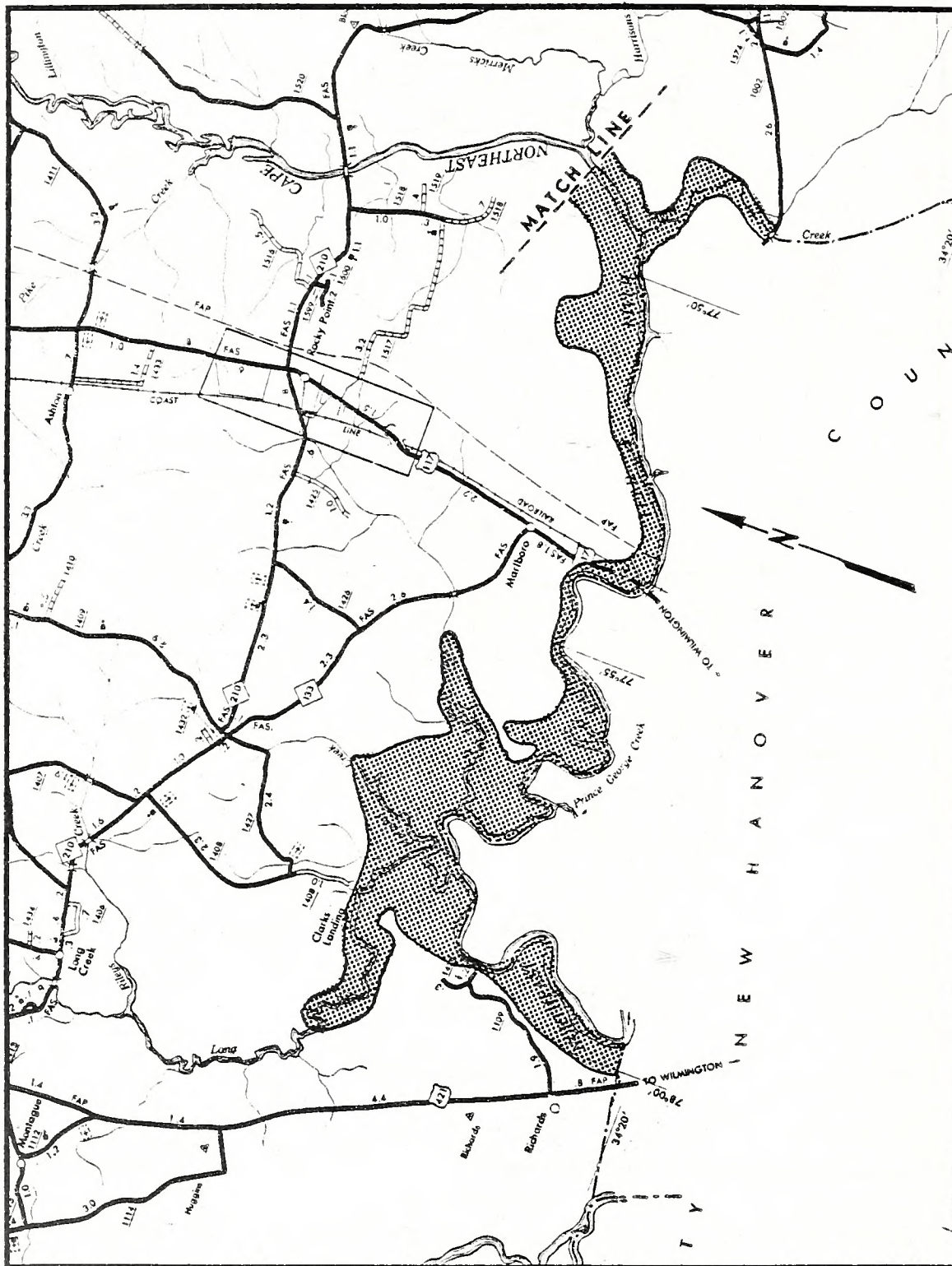


FIGURE 6. Northeast Cape Fear River Natural Area (south section). Map scale: 1 in. = 2 mi.

are abundant. Turtles slide off half-submerged logs as one passes, and sometimes a water snake or alligator splashes. Shallows along the shoreline or around the infrequent islands in the river have dense beds of the narrow-leaf form of cowdock. Because the lower reach of the river has no weirs or other impounding structures, anadromous fish move into and out of the river. Fishing pressure is light and is mostly confined to the spring runs of shad. Recreational boating is popular near the public access points, with perhaps heaviest concentration being near Castle Hayne.

The adjacent swamps of the Northeast Cape Fear add to the mystique. Large cypress trees, with diameters in excess of 6 feet are not at all uncommon. The tidally inundated swamp floor is mucky and treacherous to the timid, but unusual and interesting flora and fauna are found there. We saw the mustard, Cardamine longii, at numerous places south of NC 210, and a small population of the river quillwort, Isoetes riparia, along Island Creek. Old cypress trees with horizontal branches bedecked with resurrection fern turned out to harbor mats of the epiphytic orchid, Epidendrum conopseum. From Burgaw Creek upstream to Holly Shelter Creek, we saw in July, numerous clumps of a yellow-flowered loosestrife, tentatively identified as Lysimachia lanceolata var. hybrida. The scarlet-velvet fruits of the sarvis-leaf holly, Ilex amelanchier, impressed us as we boated up Holly Shelter Creek.

The river has long stretches of placid water south of NC 210; upstream the turns are more frequent, and sometimes an arching canopy of river birch obscures the sky. Short, dead-end coves attest to a meandering channel, and with the assistance of topographic quadrangles, oxbow ponds can be located.

The history of the river is as alluring as the biota. Barbadoan explorers reached the Stag Park vicinity in the mid-1600s. A century later rich planters-- the Ashes, the Moores, and others owned plantations along the banks. Colonial artifacts lie buried in the river silt. A marker at Castle Hayne describes an early drawbridge built across the river.

Rich in lore, rich in flora, rich in fauna, the Northeast Cape Fear demands that we slow our pace and leisurely indulge in the pleasures of an incomparable natural area. Drift with the tide by Point Pleasant or silently paddle a canoe down Harrisons Creek, you will experience a never-to-be-forgotten sensation of the richness of the out-of-doors. Northeast Cape Fear-- natural area unexcelled.

- 11B. Prose Description of Site Significance: The Northeast Cape Fear Natural Area offers multiple recreational opportunities and a superlative study area for black-water river systems. The major feature of the river and its associated swamps is that they are intact; thus they provide a lengthy corridor for wildlife, contain seven species of special interest plants, several animals (many reports of alligators, not verified by our study) of concern, and connect the major wilderness

areas in Pender County. Although activities in navigable waters and wetlands is now regulated by the Corps of Engineers, "high ground" development could have a devastating affect on the quality of the water and the remoteness aspect of the system. We rank the Northeast Cape Fear near the top of Pender County natural areas, based on the condition of its swamplands, the fact that this river is the highest volume black-water stream in southeastern North Carolina, the potential threat to it as industrial and residential development edge upstream from Wilmington, and the presence of several threatened species.

12. Significance Summary (See TABLE 2)

Legal Status, Use, and Management

13. Ownership type by percent area: Private: 99%, Public: 1%, Unknown 0%
14. Number of owners: Approximately 30
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information):
Major landowners are Bruce B. Cameron, 2219 Blythe Rd., Wilmington, NC (763-1054), Corbett Industries, Inc., Wrightsboro (Wilmington, NC) (763-4646), Southern Furniture of Conover, Inc., International Paper Company, Harry W. Williams, Williams Lumber Co., Burgaw, NC, H. H. Bate, Mrs. Nell H. Trask; public land is small section of Holly Shelter Game Lands which borders the east shore of the river.
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, other pertinent information): None
17. Attitude of owner or custodian toward preservation (contacted?):
Not contacted
18. Uses of natural area: Recreational boating, fishing, hunting
19. Uses of surrounding land: Wildland: 25%; Agricultural land, 40%; High-intensity forestry, 25%; Developed, 5%
20. Preservation Status: Category 7, 100%
21. Regulatory protections in force: Wetlands, natural hazard areas
22. Threats: Piecemeal development along the river bluffs; no threats to the overwhelming percentage of swamplands.
23. Management and Preservation Recommendation: Tributary stream swamps may be easier to manage than the main stem of the river. Island Creek and Harrison's Creek are considered exceptional areas for preservation, either by acquisition or landowner registry. Regulations in effect for activities in wetlands is probably sufficient for adequate site protection.

TABLE 2. Significance summary of Northeast Cape Fear River Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
High quality wetland community	1	Blackwater river swamp	Broad floodplain with mostly old-growth cypress
Endangered or threatened sp.	2a	Sarvis-leaf holly	Very large population in lower Holly Shelter Creek drainage
Endangered or threatened sp.	2b	Long's bittercress	Proposed inclusion, based on occurrence at two NC localities
Endangered or threatened sp.	2c	River quillwort	Major range extension southward
Endangered or threatened sp.	2d	European cow-lily	Common throughout all major drainages of natural area
Endangered or threatened sp.	2e	Creeping marsh-purslane	A single large population in Harrisons Creek
Endangered or threatened sp.	2f	Green-fly orchid	Probably largest number of colonies in NC
Endangered or threatened sp.	2g	May hawthorn	Two known populations of very rare species
Endangered or threatened sp.	2h	Anhinga	Single bird sighted

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:

Community type: Taxodium distichum-Acer rubrum-Nyssa biflora

Community cover type: Taxodium distichum

General habitat feature: Riverine swamp

Average canopy height: 60 ft

Estimated age of canopy trees: 50-200 years

Canopy cover: Closed

Estimated size of community: 80% of total acreage or 11,000 ac

Successional stage: Climax

Sere type: Pelosere

Common canopy species in community cover or community type (but not dominant): Liquidambar styraciflua, Pinus taeda

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus stricta, Ilex verticillata

Common herb stratum species in community cover or community type

(but not dominant): Senecio glabellus, Gratiola virginiana, Pluchea camphorata, Lobelia cardinalis, Decumaria barbara

24B. Soil Summary (by community type)

Soil series: Dorovan series in tidal region of river; Johnston and Lumbee soils in upper stretches of river floodplain.

Soil classification: Not determined

Soil association: Johnston-Lumbee

pH class: Strongly acid to medium acid

Moisture class: Poorly drained

Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

Other notes: None

24C. Hydrology Summary (by community type)

Hydrologic system: Riverine

Hydrologic subsystem: Tidal and Lower Perennial

Water chemistry: Fresh to mixosaline

Water regime: Tidal, regularly flooded, irregularly flooded, and nontidal, intermittently exposed, seasonally flooded.

Drainage class: Poorly drained to very poorly drained

Drainage basin: Northeast Cape Fear River

Hydrology characterization: Poorly to very poorly drained bottomland sloughs, terraces, and bars, covered with moisture-retaining silts and silty sands with water table frequently at the surface.

24D. Topography Summary

Landform: Riverine floodplain

Shelter: Deeply sheltered

Aspect: North - South in lower reach; East - West in upper reach

Slope: Level to gently sloping

Profile: Level to concave

Surface pattern: Irregularly undulating

Position: Not applicable

25. Physiographic characterization of natural area: A tidally flooded to seasonally flooded climax community of a hydric pelosere in the alluvial plain of the Northeast Cape Fear River, underlain by mostly Eocene Castle Hayne limestone in the Coastal Plain province of the Atlantic Plain. The Northeast Cape Fear drains into the estuary of the Cape Fear River.
Geological Formation: Eocene Castle Hayne limestone cover by fluvial deposits of sand, silt, and organic detritus.
Geological Formation age: Eocene formation: 40-50 million years.
26. Summary - Endangered and threatened species
- (1) Name of species: Ilex amelanchier (AQUIFOLIACEAE) Sarvis-leaf holly
Species legal status and authority: NC threatened throughout (Cooper et al. 1977).
Number of populations on site: 1
Number of individuals per population: Possibly 500
Size or maturity of individuals: Immature and mature
Phenology of population: Vegetative: 50%; Flowering: 0%; Fruiting: 50%
General vigor of population: Very vigorous
Disturbance or threats to population: None
Habitat characteristics:
Plant community: Swampy red maple-cypress- black gum woodlands
Topography: Level
Soil series: Johnston or Lumbree
Microclimate: Not determined
Drainage basin: Holly Shelter Creek and Northeast Cape Fear River
Other plants and animal species present: Plants: Fraxinus caroliniana, Ilex verticillata, Cornus stricta; Animals: see attached master species lists.
- (2) Name of species: Cardamine longii (BRASSICACEAE) Long's bittercress
Species legal status and authority: Proposed NC threatened throughout, based on present records of only two county occurrences in NC-- Pender and Jones.
Number of populations on site: 3
Number of individuals per population: Ca. 50-100
Size or maturity of individuals: Mostly mature
Phenology of population: Vegetative: 20%; Flowering: 0%; Fruiting: 80%
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:
Plant community: Open, mucky exposures in deep cypress swamps
Topography: Level
Soil series: Johnston
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River, Long Creek and Island Creek sub-basins
Other plants and animal species present: Plants: Senecio glabellus, Bacopa caroliniana. Animals: See attached master species lists.

(3) Name of species: Isoetes riparia (ISOETACEAE) River quillwort
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: Ca. 50

Size or maturity of individuals: All mature

Phenology of population: Vegetative: 0%; Flowering: Not applicable;
Fruiting: 100%

General vigor of population: Fair

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Taxodium distichum (cypress) swamp

Topography: Level

Soil series: Johnston

Microclimate: Not determined

Drainage basin: Island Creek sub-basin of Northeast Cape Fear River

Other plants and animal species present: Plants: None in this stratum.

Animals: See attached master species lists.

(4) Name of species: Nuphar luteum ssp. sagittifolium (NYMPHAEACEAE)

Spatter-dock or cowdock

Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: Too numerous to count, probably more than 100

Size or maturity of individuals: All stages of growth and reproduction

Phenology of population: Vegetative: 60%; Flowering: 20%; Fruiting 20%

General vigor of population: Very vigorous

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Spatter-dock (floating leaf, rooted)

Topography: Not applicable

Soil series: Not determined

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River and all tributaries

Other plants and animal species present: Plants: None. Animals: Not determined.

(5) Name of species: Ludwigia repens (ONAGRACEAE) Creeping marsh-purslane

Number of populations on site: 1

Number of individuals per population: Ca. 200

Size or maturity of individuals: Mature

Phenology of population: Vegetative: 100%; Flowering: 0%; Fruiting: 0%

General vigor of population: Vigorous

Disturbances or threats to population: None

Habitat characteristics:

Plant community: Slough in cypress swamp

Topography: Concave

Soil series: Lumbee

Microclimate: Not determined

Drainage basin: Harrisons Creek sub-basin of Northeast Cape Fear River.

Other plants and animal species present: Plants: None in this stratum.

Animals: Not determined.

(6) Name of species: Epidendrum conopseum (ORCHIDACEAE) Green-fly Orchid

Species legal status and authority: NC endangered peripheral (Cooper et al. 1977)

Number of populations on site: 9

Number of individuals per population: 20 to ca. 200

Size or maturity of populations: Mature

Phenology of population: Due to different times of field survey, some of the populations had not begun to flower. In late July when the species was flowering, a typical colony was about 80% vegetative and 20% flowering.

General vigor of population: Vigorous

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Cypress swamp

Topography: Not applicable

Soil series: Not applicable

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River and larger tributary streams

Other plants and animal species present: Plants: Polypodium polypodioides, Tillandia usneoides. Animals: See bird list in attached master species lists.

(7) Name of species: Crataegus aestivalis (ROSACEAE) May hawthorn

Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 1 observed

Size or maturity of population: Mature

Phenology of population: The single plant, when found was in fruit

General vigor of population: Good

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Cypress-mixed hardwood

Topography: Level

Soil series: Lumbree

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Plants: Quercus lyrata, Quercus laurifolia, Viburnum nudum. Animals: See attached master species lists.

(8) Name of species: Anhinga anhinga Water turkey or anhinga

Species legal status and authority: NC threatened (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 1

Size or maturity of population: Mature

Phenology of population: Not applicable

General vigor of population: Not determined

Disturbance or threats to population: Not determined

Habitat characteristics:

Plant community: Cypress swamp

Topography: Level
Soil series: Johnston
Microclimate: Not applicable
Drainage basin: Island Creek sub-basin of Northeast Cape Fear River
Other plants and animal species present: Plants: Fraxinus caroliniana
Tillandsia usneoides, Acer rubrum, Cornus stricta. Animals: See
attached master species lists.

(See FIGURES 7, 8 for detailed maps of endangered and threatened species locations.)

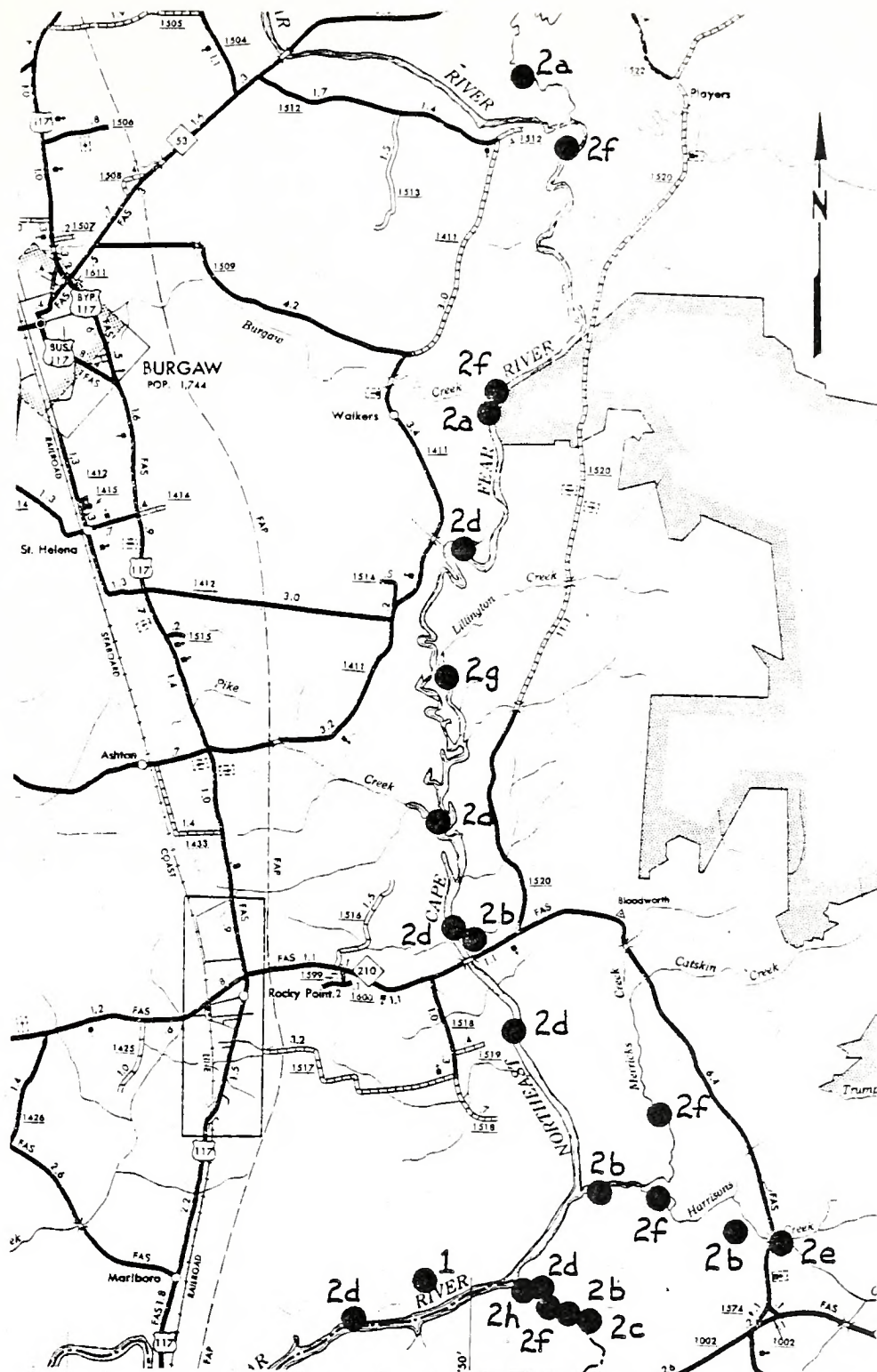


FIGURE 7. Significant features of Northeast Cape Fear River Natural Area (north section). Code: (1) High quality wetland community, (2) Endangered or threatened species. Map scale: 1 in. = 2 mi.

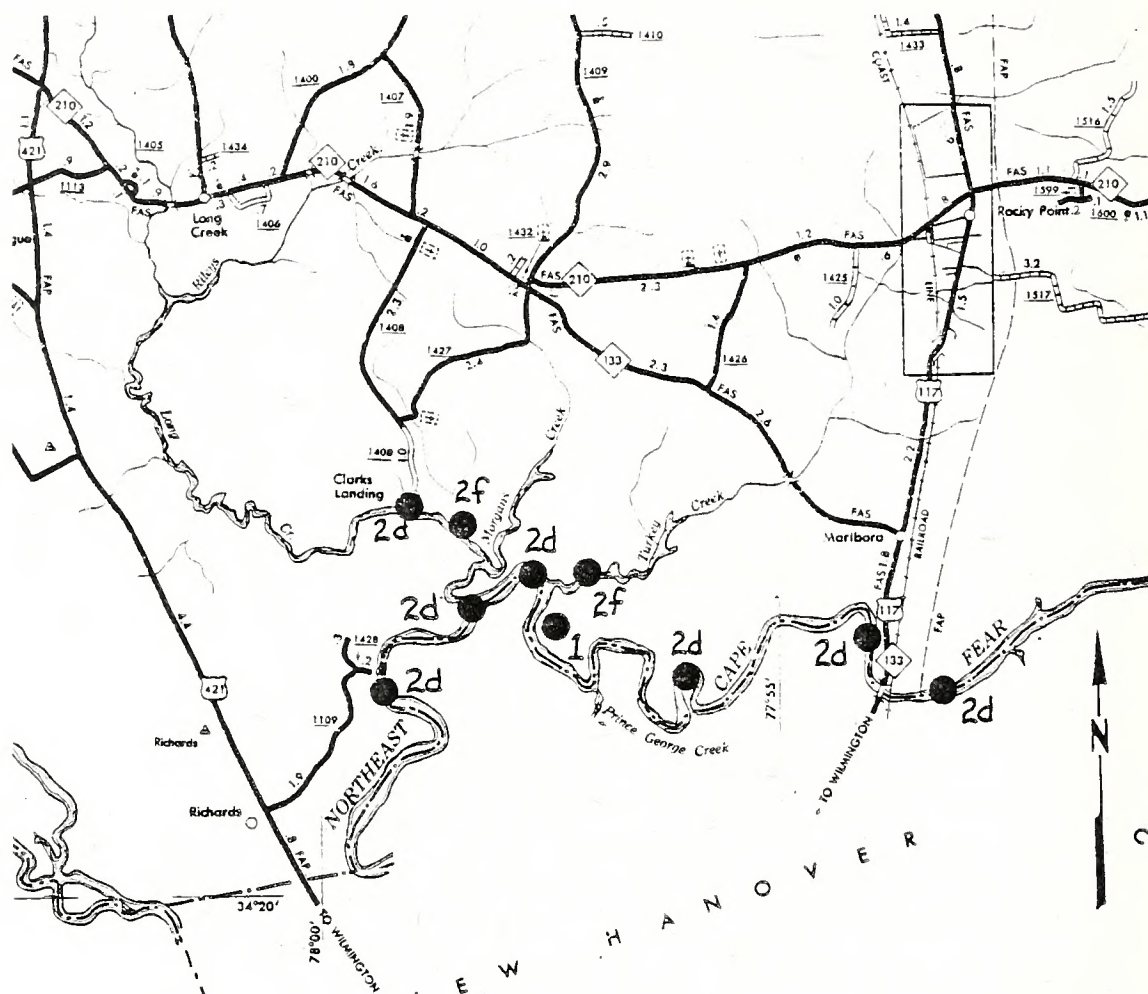


FIGURE 8. Significant features of Northeast Cape Fear River Natural Area (south section). Code: (1) High quality wetland community, (2) Endangered or threatened species. Map scale: 1 in. = 2 mi.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE

Justicia ovata
Ruellia caroliniensis

ACERACEAE

Acer rubrum

ALISMATACEAE

Sagittaria graminea

AMARANTHACEAE

Alternanthera philoxeroides
Amaranthus cannabinus

AMARYLLIDACEAE

Hymenocallis crassifolia
Hypoxis hirsuta var. leptocarpa

ANACARDIACEAE

Rhus radicans
R. vernix

ANNONACEAE

Asimina triloba

APIACEAE

Centella asiatica
Cicuta maculata
Eryngium aquaticum
Hydrocotyle umbellata
Ptilimnium capillaceum
Sium suave

AQUIFOLIACEAE

Ilex amelanchier
I. coriacea
I. glabra
I. opaca
I. verticillata

ARACEAE

Arisaema triphyllum
Orontium aquaticum
Peltandra virginica

ARALIACEAE

Aralia spinosa

ARECACEAE

Sabal minor

ARISTOLOCHIACEAE

Aristolochia serpentaria
Hexastylis arifolia

ASPIDIACEAE

Athyrium asplenoides
Onoclea sensibilis
Thelypteris palustris

ASPLENIACEAE

Asplenium platyneuron

ASTERACEAE

Baccharis halimifolia

Bidens bipinnata

B. laevis

Coreopsis helianthoides

Helenium autumnale

Mikania scandens

Pluchea camphorata

Senecio glabellus

Vernonia noveboracensis

BETULACEAE

Alnus serrulata

Betula nigra

Carpinus caroliniana

BIGNONIACEAE

Anisostichus capreolatus

Campsis radicans

Catalpa speciosa

BLECHNACEAE

Woodwardia areolata

W. virginica

BRASSICACEAE

Cardamine hirsuta

C. longii

C. pensylvanica

Rorippa islandica

BROMELIACEAE

Tillandsia usneoides

CALLITRICHACEAE

Callitriche heterophylla

CAMPANULACEAE

Lobelia cardinalis

CAPRIFOLIACEAE

Lonicera japonica

L. sempervirens

Sambucus canadensis

Viburnum nudum

CLETHRACEAE

Clethra alnifolia

CONVOLVULACEAE

Cuscuta compacta

CORNACEAE

Cornus amomum

C. stricta

CUCURBITACEAE

Melothria pendula

CYPERACEAE

Carex crinita

C. elliotii

Carex folliculata var. *australis*
C. incomperta
C. lurida
C. rosea
Eleocharis obtusa
Scirpus cyperinus
CYRILLACEAE
Cyrilla racemiflora
DIOSCOREACEAE
Dioscorea villosa
EBENACEAE
Diospyros virginiana
ERICACEAE
Leucothoe axillaris
L. racemosa
Lyonia lucida
Rhododendron nudiflorum
Vaccinium stamineum
ERIOCAULACEAE
Eriocaulon compressum
EUPHORBIACEAE
Sapium sebiferum
FABACEAE
Albizzia julibrissin
Amorpha fruticosa
Amphicarpa bracteata
Apios americana
Wisteria frutescens
FAGACEAE
Quercus falcata var. *pagodaefolia*
Q. laurifolia
Q. lyrata
Q. michauxii
Q. nigra
Q. shumardii
GENTIANACEAE
Nymphoides aquatica
HALORAGACEAE
Proserpinaca palustris
P. pectinata
HAMAMELIDACEAE
Liquidambar styraciflua
HIPPOCASTANACEAE
Aesculus pavia
HYDROCHARITACEAE
Egeria densa
HYPERICACEAE
Hypericum densiflorum
IRIDACEAE
Iris tridentata

ISOETACEAE
 Isoetes riparia
 JUGLANDACEAE
 Carya aquatica
 C. glabra
 C. tomentosa
 JUNCACEAE
 Juncus effusus
 J. repens
 LAMIACEAE
 Collinsonia canadensis
 Glechoma hederacea
 Lycopus virginicus
 Teuchrium canadensis
 LAURACEAE
 Lindera benzoin
 Persea borbonia
 Sassafras albidum
 LEMNACEAE
 Lemna sp.
 Spirodela polyrhiza
 Wolffiella floridana
 LILIACEAE
 Medeola virginiana
 Smilax glauca
 S. rotundifolia
 LOGANIACEAE
 Gelsemium sempervirens
 LORANTHACEAE
 Phoradendron serotinum
 LYTHRACEAE
 Decodon verticillatus
 Lythrum lineare
 Rotala ramosior
 MAGNOLIACEAE
 Liriodendron tulipifera
 Magnolia virginiana
 MALVACEAE
 Hibiscus moscheutos
 MENISPERMACEAE
 Cocculus carolinus
 MORACEAE
 Maclura pomifera
 Morus rubra
 MYRICACEAE
 Myrica cerifera
 NYMPHAEACEAE
 Nuphar luteum ssp. *sagittifolium*
 Nymphoides aquatica
 NYSSACEAE
 Nyssa aquatica
 N. biflora

OLEACEAE

Chionanthus virginicus
Fraxinus caroliniana
F. pensylvanica
F. pensylvanica var. subintegerrima
Ligustrum sinense

ONAGRACEAE

Ludwigia alternifolia
L. palustris
L. repens
L. uruguayensis
Oenothera fruticosa

OPHIOGLOSSACEAE

Botrychium bitermatum

ORCHIDACEAE

Epidendrum conopseum
Spiranthes cernua var. odorata

OSMUNDACEAE

Osmunda cinnamomea
O. regalis var. spectabilis

PASSIFLORACEAE

Passiflora lutea

PINACEAE

Pinus taeda

PLATANACEAE

Platanus occidentalis

POACEAE

Arundinaria gigantea
Axonopus affinis
Echinochloa crus-galli
Elymus virginicus
Leersia oryzoides
Melica mutica
Panicum virgatum
Uniola laxa
Zizaniopsis miliacea

POLYGONACEAE

Polygonum arifolium
P. hydropiperoides
P. pensylvanicum
P. persicaria
P. punctatum
P. sagittatum
Rumex verticillatus
Tovara virginiana

POLYPODIACEAE

Polypodium polypodioides

PONTEDERIACEAE

Pontederia cordata

PRIMULACEAE

Lysimachia lanceolata var. hybrida
Samolus parviflorus

RANUNCULACEAE
 Clematis crispa
 Ranunculus carolinianus
 Thalictrum thalictroides
 RHAMNACEAE
 Berchemia scandens
 ROSACEAE
 Crataegus aestivalis
 C. flava
 Rosa palustris
 Rubus betulifolius
 Sorbus arbutifolius
 RUBIACEAE
 Cephalanthus occidentalis
 Oldenlandia uniflora
 Richardia brasiliensis
 SALICACEAE
 Populus heterophylla
 Salix caroliniana
 S. nigra
 SAURURACEAE
 Saururus cernuus
 SAXIFRAGACEAE
 Decumaria barbara
 Itea virginica
 SCROPHULARIACEAE
 Bacopa caroliniana
 Gratiola virginiana
 Mimulus ringens
 SELAGINELLACEAE
 Selaginella apoda
 SYMPLOCACEAE
 Symplocos tinctoria
 TAXODIACEAE
 Taxodium ascendens
 T. distichum
 THEACEAE
 Gordonia lasianthus
 Stewartia malacodendron
 TILIACEAE
 Tilia caroliniana
 TYPHACEAE
 Typha angustifolia
 T. domingensis
 T. latifolia
 ULMACEAE
 Celtis laevigata
 Ulmus americana
 URTICACEAE
 Boehmeria cylindrica
 Pilea pumila

VERBENACEAE

Callicarpa americana
Lippia nodiflora

VIOLACEAE

Viola papilionacea

VITACEAE

Ampelopsis arborea
Parthenocissus quinquefolia
Vitis aestivalis
V. labrusca
V. rotundifolia

AMPHIBIANS

Slimy Salamander
Southern Toad
Pickerel Frog
Leopard Frog

REPTILES

Snapping Turtle
Yellow-bellied Turtle
Green Anole
Six-lined Racerunner
Five-lined Skink
Banded Water Snake
Brown Water Snake
Rough Green Snake
Mud Snake
Black Racer
Yellow Rat Snake
Southern Copperhead
Eastern Cottonmouth

BIRDS

Key

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Anhinga
Great Blue Heron
Green Heron
Little Blue Heron

SV
PR* (?)
SR*
SV

Yellow-crowned Night Heron	SR* (?)
White Ibis	SV
Wood Duck	PR*
Turkey Vulture	PV
Red-shouldered Hawk	PR*
Bobwhite	PR*
Spotted Sandpiper	T
Solitary Sandpiper	T
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Screech Owl	PV
Barred Owl	PR*
Common Nighthawk	SV
Chimney Swift	SR*
Ruby-throated Hummingbird	SV
Belted Kingfisher	PR*
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Eastern Kingbird	SV
Crested Flycatcher	SR*
Eastern Phoebe	WR
Acadian Flycatcher	SR*
Rough-winged Swallow	SR*
Barn Swallow	SR*
Purple Martin	SV
Blue Jay	PR*
Fish Crow	PR*
Common Crow	PV
Carolina Chickadee	PR*
Tufted Titmouse	PR*
White-breasted Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
Brown Thrasher	PR*
Wood Thrush	SR*
Blue-gray Gnatcatcher	SR*
Ruby-crowned Kinglet	WR
Cedar Waxwing	WR
Starling	PR*
White-eyed Vireo	SR*
Yellow-throated Vireo	SR*
Solitary Vireo	WR
Red-eyed Vireo	SR*
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Blue-winged Warbler	T
Northern Parula Warbler	SR*

Yellow Warbler	T
Yellow-rumped Warbler	WR
Yellow-throated Warbler	SR*
Pine Warbler	PV
Prairie Warbler	SV
Kentucky Warbler	SR* (?)
Common Yellowthroat	PR*
Yellow-breasted Chat	SV
Red-winged Blackbird	PR*
Orchard Oriole	SR*
Common Grackle	PR*
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Cardinal	PR*
Rufous-sided Towhee	PR*
White-throated Sparrow	WR
Swamp Sparrow	WR

MAMMALS

Opossum
 Raccoon
 Eastern Gray Squirrel
 Marsh Rabbit
 Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Black River
2. County: Pender (and adjacent Bladen)
3. Location: The natural area stretches from the mouth of the Black River where it empties into the Cape Fear upstream for approximately 25 river miles to a point about 2 miles downstream from Beatty Bridge (SR 1201). Coordinates: 34°20'N, 78°03'W to 34°30'N, 78°15'W (FIGURE 9).
4. Topographic Quadrangle(s): Acme (1954), Atkinson (1955), White Lake (1954)
5. Size: 9,500 ac
6. Elevation: 3 ft to 8 ft above mean sea level
7. Access: Private and public boating access points along the Cape Fear River; a single Wildlife Resources landing from an unnumbered dirt road off SR 1547 in Bladen County, about a mile downstream from the NC 53 bridge. The river corridor can be reached via NC 210.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May through September, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: The Black River is, in many respects, similar to the Northeast Cape Fear, but it is also different. The channel takes a more winding course, and in the upper stretches, is filled with shallow sandbars, which scarcely allow navigation by small outboard engines. Scattered residential development is present along portions of the river.

Along the lower reach of the river, luxuriant marshes are frequent, although never reaching appreciable areal extent. Swamps are low and poorly drained, seldom having any banks of a foot or two in height as occurs along the Northeast Cape Fear. Instead, the river gradually decreases in depth to a rooted aquatic vegetation zone that grades into marshlands, or typically into cypress-gum-maple woodlands. Bluffs are unusual and landmarks difficult to discern. Upstream from NC 210, the channel divides and re-divides, thus forming numerous small islands. Short, dead-end sloughs diverge, and unless one is familiar with the river, or has appropriate maps, the first-time trip upstream can result in many wrong turns.

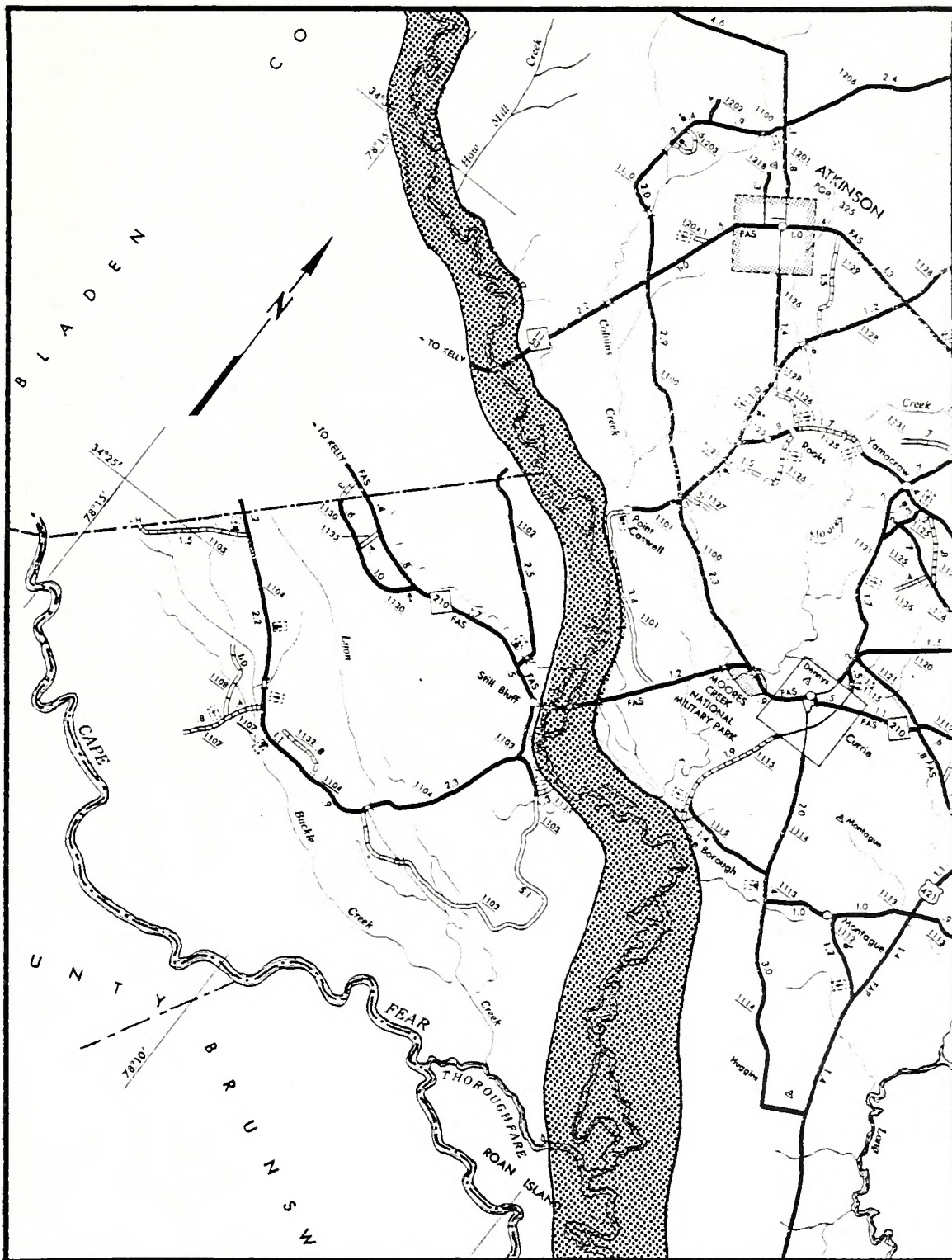


FIGURE 9. Black River Natural Area. Map scale: 1 in. = 2 mi.

Even before reaching NC 53 on an upstream trip, one encounters segments of sluggish water followed by narrow, sharp bends where river birches bridge the canopy, snags project from the banks, and the water swirls and eddies more like the channels of Piedmont streams.

Vegetation is predominantly a cypress-hardwood forest in the floodplain swamps, until one approaches NC 53. Suddenly a grove of large cypress trees appears on the north bank. The trees are flat-topped, and the horizontal branches contain a profusion of resurrection ferns and Spanish moss. Infrequently, clumps of green-fly orchid can be detected with binoculars. Beyond NC 53, the cypress forest (which we have named the "Larkins Cove Cypress Forest" after one of the owners) becomes more spectacular. The stand extends to the south bank (Bladen County) and partly into the lower reach of Colly Swamp. Ancient individuals have diameters above the swollen buttresses of 6 or more feet; the buttresses themselves may be 15-20 feet in thickness. This forest is unique for Pender (and Bladen?) County and is in need of additional study. During the latter part of the survey, an examination of one small area revealed May hawthorn and sarvis holly, and other rare species are likely to occur there.

Fauna in the area is likewise diverse, particularly birds, and probably amphibians and reptiles. Extremely heavy rains during August prevented intensive investigation.

- 11B. Prose Description of Site Significance: Several noteworthy plants were found in the Black River corridor during the survey, but the most important feature of the natural area is the Larkins Cove cypress forest. Not only are the trees extraordinarily large, but the shrub stratum and herb layer contains rare species. The area is not delineated on our map, partly because the extent of the forest in Bladen County was not investigated. In all of Pender County, we did not see any counterpart forest, either in overall size of trees, species composition, or size of stand. Future reassessment of this basin may warrant a map revision in order to include more of the Larkins Cove stand and less of the floodplain downstream.

12. Significance Summary (see TABLE 3)

Legal Status, Use, and Management

13. Ownership type by percent area: Private: 100%
14. Number of owners: Approximately 20
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information):
Major landowners are C. Haymore Larkins, Jr., John D. Larkins, Jr., Canal Industries, International Paper Co., Georgia-Pacific, Corbett Industries, David A. Barefoot, Catharine Lewis heirs, Benjamin Cone, A. Wallace Moore, R. S. Hilburn, Carole Keith Bruning heirs.

TABLE 3. Significance summary of Black River Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
High quality wetland community	1	Blackwater river swamp	Broad floodplain which provides a wildland corridor for game spp. and nongame fauna
High quality wetland community	2	Virgin or ancient second-growth cypress forest	Most extensive grouping of largest cypress seen in county
Endangered or threatened sp.	3a	<u>Sagittaria stagnorum</u>	One of three populations known in NC (proposed)
Endangered or threatened sp.	3b	Sarvis-leaf holly	Abundant in upper drainage of natural area
Endangered or threatened sp.	3c	Green-fly orchid	Occasional colonies, less extensive than in Northeast Cape Fear N. A.
Endangered or threatened sp.	3d	May hawthorn	Sparse in area; not seen with fruit
Outstanding aquatic feature	4	Black River	Sparsely developed, scenic stream, high potential for pastoral recreation

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Not available
17. Attitude of owner or custodian toward preservation (contacted?): One custodian was contacted. He is manager of a large tract on the upper stretch of the river, and the property is currently managed for timber and wildlife.
18. Uses of natural area: Recreational boating, hunting, fishing.
19. Uses of surrounding land: Wildland: 60%; Agricultural land: 10%; High-intensity forestry: 25%; Developed: 5%
20. Preservation Status: Category 4, 10%; Category 7, 90%
21. Regulatory protections in force: Wetlands, natural hazard area
22. Threats: Small amounts of local residential development, limited to higher bluffs and banks of river.
23. Management and Preservation Recommendation: Acquisition of the the Larkins Cove Cypress Forest, or agreement among landowners to protect the stand as much as possible. The remainder of the river could be better utilized with an additional boat ramp on the east side, downstream from NC 210. At the mouth of Black River is a large island, Roan Island, that was circumnavigated during the survey, but the interior was not examined from the ground. Further study may show this island to be a suitable natural area. It is owned, in various tracts by Corbett Industries.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:

Community type: Taxodium distichum- Acer rubrum forest

Community cover type: Taxodium distichum

General habitat feature: Riverine swamp

Average canopy height: 40 ft

Estimated age of canopy trees: 80-250 years

Canopy cover: Closed to somewhat open

Estimated size of community: 7,500 ac, with the Larkins Cove Cypress stand comprising approximately 600 ac.

Successional stage: Climax

Sere type: Pelosere

Common canopy species in community cover or community type (but not dominant): Polypodium polypodioides, Nyssa biflora, Quercus lyrata, Liquidambar styraciflua

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus stricta, Crataegus sp. Ilex verticillata, Betula nigra

Common herb stratum species in community cover or community type (but not dominant): Justicia ovata, Boehmeria cylindrica

- 24B. Soil Summary (by community type)
Soil series: Dorovan series in tidal region of river; Johnston and Lumbree soils in upper reaches of river
Soil classification: Not determined
Soil association: Johnston-Lumbree
pH class: Strongly acid to medium acid
Moisture class: Poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).
- 24C. Hydrology Summary (by community type)
Hydrologic system: Riverine
Hydrologic subsystem: Tidal and Lower Perennial
Water chemistry: Fresh to mixosaline
Water regime: Tidal, regularly flooded, irregularly flooded, and nontidal, intermittently exposed, seasonally flooded
Drainage class: Poorly drained to very poorly drained
Drainage basin: Cape Fear River
Hydrology characterization: Poorly to very poorly drained bottomland sloughs, terraces, and bars, covered with moisture-retaining silts and silty sands with water table frequently at the surface.
- 24D. Topography Summary
Landform: Riverine floodplain
Shelter: Deeply sheltered
Aspect: More or less easy - west
Slope: Level to gently sloping
Profile: Level to concave
Surface patterns: Irregularly undulating
Position: Not applicable
25. Physiographic characterization of natural area: A tidally flooded to seasonally flooded climax community of a hydric pelosere in the alluvial plain of the Black River; area underlain by Cretaceous (Pee Dee formation) sands, impure limestones, marine clays and interbedded sands in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Basement formation is the Cretaceous Pee Dee formation.
Geological Formation age: 60 million years
26. Summary - Endangered and threatened species
(1) Name of species: Sagittaria stagnorum, sensu Godfrey & Wooten; S. subulata var. gracillima sensu Radford et al. (ALISMATACEAE)
no common name
Species legal status and authority: Proposed as a threatened peripheral, based on locations in only Pender and Wilson Counties in North Carolina.
Number of populations on site: 1
Number of individuals per population: Difficult to estimate, but possibly a few thousand

Size or maturity of individuals: Mostly immature
 Phenology of population: Vegetative: 85%; Flowering: 10%; Fruiting: 5%
 General vigor of population: Presumed to be vigorous, but population vigor is likely regulated by flooding or other ecological conditions in the mucky sloughs where the plant grows. When discovered here, the plants were often covered by a thick algal mat.
 Disturbance or threats to population: None
 Habitat characteristics:
 Plant community: Cypress, with considerable understory of water ash
 Topography: Slightly concave
 Soil series: Johnston
 Microclimate: Not determined
 Drainage basin: Black River tributary of the Cape Fear River
 Other plants and animal species present: Plants: Bacopa caroliniana, Gratiola sp. Micranthemum umbrosum. Animals: See attached master species lists.

(2) Name of species: Ilex amelanclier (AQUIFOLIACEAE) Sarvis-leaf holly
 Species legal status and authority: NC threatened throughout (Cooper et al. 1977)
 Number of populations on site: 1 observed
 Number of individuals per population: 50 or more
 Size or maturity of individuals: Immature and mature
 Phenology of population: Vegetative: 50%, Flowering: 0%; Fruiting 50%
 General vigor of population: Population found after August floods. Leaves and probably fruits had been stripped from plants. A new growth of leaves was apparent. Population presumed to be vigorous.
 Disturbance or threats to population: None other than aforementioned flooding hazard.
 Habitat characteristics:
 Plant community: Cypress with understory of water ash
 Topography: Level
 Soil series: Johnston or Lumbee
 Microclimate: Not determined
 Drainage basin: Black River tributary of Cape Fear River
 Other plants and animal species present: Plants: Rhus radicans, Decumaria barbara, Boehmeria cylindrica. Animals: See attached master species lists.

(3) Name of species: Epidendrum conopseum (ORCHIDACEAE) Green-fly orchid
 Species legal status and authority: NC endangered peripheral (Cooper et al. 1977)
 Number of populations on site: 1
 Number of individuals per population: 50-150
 Size or maturity of population: Mature
 Phenology of population: Vegetative: 100%; Flowering 0%; Fruiting 0%
 General vigor of population: Vigorous
 Disturbance or threats to population: None
 Habitat characteristics:
 Plant community: Cypress swamp
 Topography: Level

Soil series: Johnston
Microclimate: Not determined
Drainage basin: Black River tributary of Cape Fear River
Other plants and animal species present: Plants: Polypodium polypodioides, Decumaria barbara, Tillandsia usneoides. Animals: See attached master species lists.
(4) Name of species: Crataegus aestivalis (ROSACEAE) May hawthorn
Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 10
Size or maturity of population: Immature and mature
Phenology of population: Vegetative: 100%; Flowering: 0%; Fruiting: 0%
General vigor of population: Fair
Disturbance or threats to population: Intense shading and bank erosion
Habitat characteristics:
Plant community: Cypress swamp
Topography: Level to gently sloping
Soil series: Lumbee
Microclimate: Not determined
Drainage basin: Black River tributary of the Cape Fear River
Other plants and animal species present: Plants: Betula nigra, Salix nigra, Ilex verticillata, Carpinus carolinianus. Animals: See attached master species lists.

(See FIGURE 10 for detailed map of endangered and threatened species locations.)

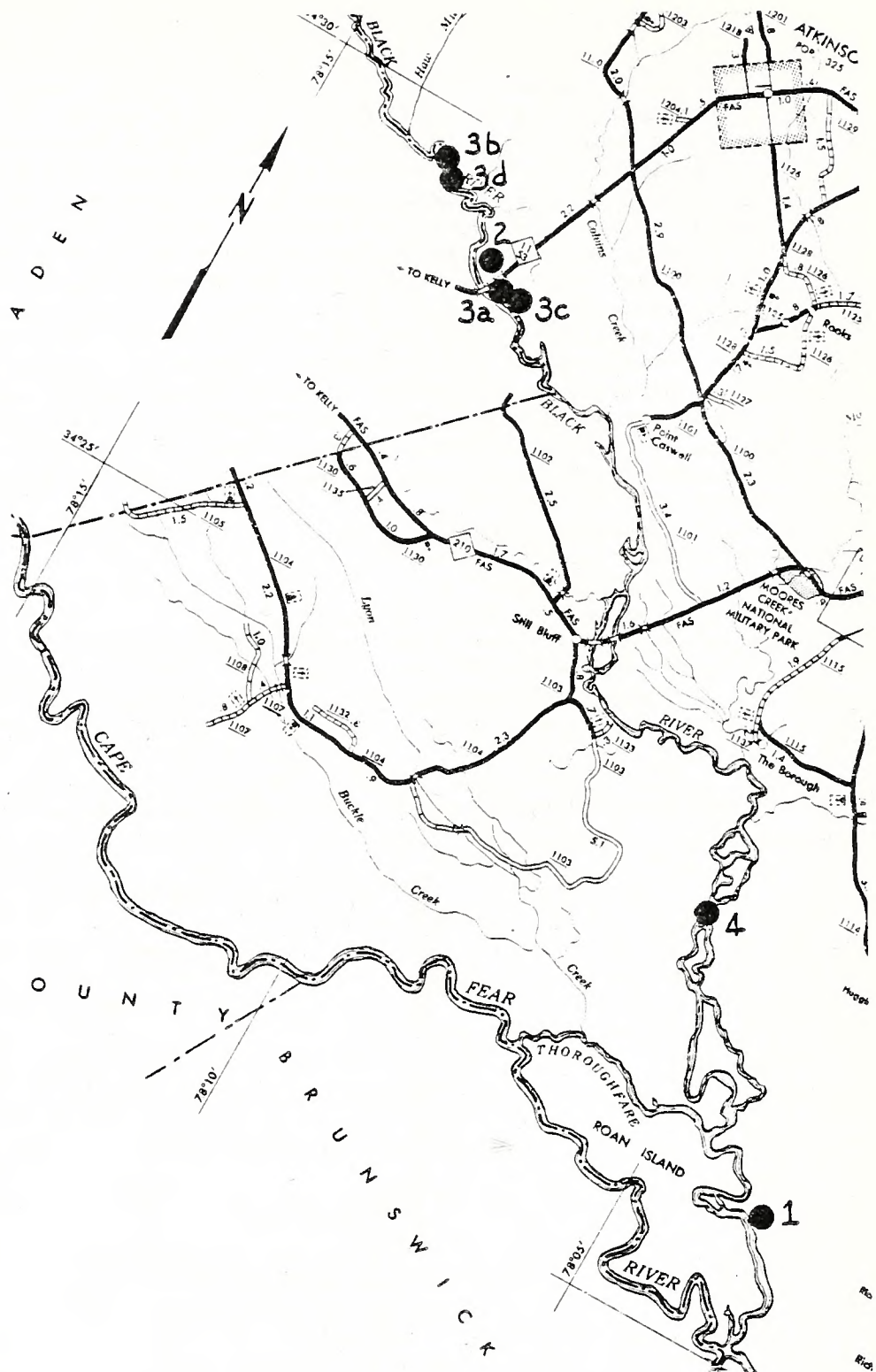


FIGURE 10. Significant features of Black River Natural Area. Code: (1) High quality wetland community, (2) High quality wetland community (possible virgin stand), (3) Endangered or threatened species, (4) Outstanding aquatic feature. Map scale: 1 in. = 2 mi.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE

Justicia ovata

ACERACEAE

Acer rubrum

AIZOACEAE

Mollugo verticillata

ALISMACEAE

Sagittaria graminea

S. stagnorum (S. subulata var. gracillima)

S. subulata

AMARANTHACEAE

Alternanthera philoxeroides

AMARYLLIDACEAE

Hymenocallis crassifolia

ANACARDIACEAE

Rhus radicans

R. vernix

APIACEAE

Centella asiatica

Cicuta maculata

Hydrocotyle umbellata

Ptilimnium capillaceum

AQUIFOLIACEAE

Ilex amelanchier

I. coriacea

I. glabra

I. verticillata

ARACEAE

Orontium aquaticum

Peltandra virginica

ARECACEAE

Sabal minor

ASPIDIACEAE

Athyrium asplenoides

Onoclea sensibilis

Thelypteris palustris

ASPLENIACEAE

Asplenium platyneuron

ASTERACEAE

Bidens aristosa

Mikania scandens

Pluchea camphorata

Senecio glabellus

Vernonia noveboracensis

BETULACEAE

Alnus serrulata

Betula nigra
 Carpinus caroliniana
 BIGNONIACEAE
 Anisostichus capreolata
 Campsis radicans
 BLECHNACEAE
 Woodwardia areolata
 W. virginica
 BROMELIACEAE
 Tillandsia usneoides
 CAMPANULACEAE
 Lobelia cardinalis
 CAPRIFOLIACEAE
 Sambucus canadensis
 Viburnum nudum
 CLETHRACEAE
 Clethra alnifolia
 CONVOLVULACEAE
 Cuscuta compacta
 CORNACEAE
 Cornus stricta
 CYPERACEAE
 Carex intumescens
 C. lupulina
 C. rosea
 Fuirena squarrosa
 Rhynchospora macrostachya
 Scirpus cyperinus
 CYRILLACEAE
 Cyrilla racemiflora
 ERICACEAE
 Leucothoe axillaris
 L. racemosa
 Lyonia lucida
 Rhododendron nudiflorum
 R. viscosum
 ERIOCAULACEAE
 Eriocaulon compressum
 FABACEAE
 Amorpha fruticosa
 Cassia nictitans
 Daubentonia punicea
 Wisteria sinensis
 FAGACEAE
 Quercus laurifolia
 Q. lyrata
 Q. michauxii
 Q. nigra
 Q. phellos
 HAMAMELIDACEAE
 Liquidambar styraciflua

IRIDACEAE
 Iris tridentata
 JUGLANDACEAE
 Carya aquatica
 C. glabra
 JUNCACEAE
 Juncus biflorus
 J. effusus
 LAMIACEAE
 Lycopus rubellus
 Salvia lyrata
 Satureja georgiana
 Teuchrium canadensis
 LAURACEAE
 Persea borbonia
 LILLIACEAE
 Smilax glauca
 S. laurifolia
 S. rotundifolia
 LOGANIACEAE
 Gelsemium sempervirens
 LORANTHACEAE
 Phoradendron serotinum
 LYTHRACEAE
 Decodon verticillatus
 MAGNOLIACEAE
 Liriodendron tulipifera
 Magnolia virginiana
 MORACEAE
 Morus rubra
 MYRICACEAE
 Myrica cerifera
 NYMPHAEACEAE
 Nuphar luteum ssp. sagittifolium
 NYSSACEAE
 Nyssa aquatica
 N. biflora
 OLEACEAE
 Fraxinus caroliniana
 F. pensylvanica var. subintegerrima
 ONAGRACEAE
 Ludwigia palustris
 ORCHIDACEAE
 Epidendrum conopseum
 Spiranthes cernua var. odorata
 OSMUNDACEAE
 Osmunda cinnamomea
 O. regalis var. spectabilis
 PINACEAE
 Pinus taeda

PLATANACEAE
 Platanus occidentalis
 POACEAE
 Andropogon gerardi
 Arundinaria gigantea
 Eleusine indica
 Elymus virginicus
 Erianthus giganteus
 Glyceria striata
 Panicum hemitomon
 Sacciolepis striata
 POLYGONACEAE
 Polygonum arifolium
 P. hydropiperoides
 P. punctatum
 P. sagittatum
 POLYPODIACEAE
 Polypodium polypodioides
 PONTEDERIACEAE
 Pontederia cordata
 PRIMULACEAE
 Samolus parviflorus
 RHAMNACEAE
 Berchemia scandens
 ROSACEAE
 Crataegus aestivalis
 Rosa palustris
 Rubus argutus
 RUBIACEAE
 Cephalanthus occidentalis
 SALICACEAE
 Populus heterophyllus
 Salix caroliniana
 S. nigra
 SAURURACEAE
 Saururus cernuus
 SAXIFRAGACEAE
 Decumaria barbara
 Itea virginica
 SCROPHULARIACEAE
 Bacopa caroliniana
 Gratiola neglecta
 G. virginiana
 Micranthemum umbrosum
 TAXODIACEAE
 Taxodium distichum
 TYPHACEAE
 Typha angustifolia
 T. domingensis
 T. latifolia

ULMACEAE

Celtis laevigata

Ulmus americana

URTICACEAE

Boehmeria cylindrica

VERBENACEAE

Lippia nodiflora

VIOLACEAE

Viola papilionacea

VITACEAE

Ampelopsis arborea

Parthenocissus quinquefolia

Vitis aestivalis

V. rotundifolia

AMPHIBIANS

Leopard Frog

Bullfrog

REPTILES

Yellow-bellied Turtle

Banded Water Snake

Red-bellied Water Snake

Black Racer

Corn Snake

BIRDS

Key

PR = Permanent resident

SR = Summer resident

WR = Winter resident

T = Transient, spring or fall

PV, SV, WV = Visitor; permanent, summer or winter

* = Breeding or suspected breeding at site

Great Blue Heron

PR* (?)

Green Heron

SR*

Little Blue Heron

SV

Louisiana Heron

SV

Yellow-crowned Night Heron

SR* (?)

White Ibis

SV

Wood Duck

PR*

Turkey Vulture

PV

Black Vulture

PV

Red-tailed Hawk

PV

Red-shouldered Hawk

PR*

Osprey	SV
Bobwhite	PV
Spotted Sandpiper	T
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Barred Owl	PR*
Chimney Swift	SR*
Ruby-throated Hummingbird	SV
Belted Kingfisher	PR*
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Red-headed Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Crested Flycatcher	SR*
Acadian Flycatcher	SR*
Rough-winged Swallow	SR*
Barn Swallow	SR*
Purple Martin	SV
Blue Jay	PR*
Fish Crow	PR*
Common Crow	PR*
Carolina Chickadee	PR*
Tufted Titmouse	PR*
White-breasted Nuthatch	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
Brown Thrasher	PR*
Wood Thrush	SR*
Eastern Bluebird	PV
Blue-gray Gnatcatcher	SR*
Starling	PR*
White-eyed Vireo	SR*
Yellow-throated Vireo	SR*
Red-eyed Vireo	SR*
Black-and-white Warbler	T
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Northern Parula Warbler	SR*
Yellow-rumped Warbler	WR
Yellow-throated Warbler	SR*
Pine Warbler	PR*
Prairie Warbler	SV
Northern Waterthrush	T
Louisiana Waterthrush	SR* (?)
Common Yellowthroat	PV
Hooded Warbler	SR*
American Redstart	SR* (?)

House sparrow	PV
Red-winged Blackbird	PR*
Orchard Oriole	SR*
Common Grackle	PR*
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Cardinal	PR*
Indigo Bunting	SV
American Goldfinch	WR
Rufous-sided Towhee	PR*
White-throated Sparrow	WR

MAMMALS

Opossum
 Raccoon
 Eastern Gray Squirrel
 Muskrat
 Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Southwest Ridge
2. County: Pender
3. Location: East central part of county in the Northeast Cape Fear River Basin. Area is south to west of Ashes Creek and lie adjacent to and parallels the northern boundary of Holly Shelter Game Lands. Coordinates: 34°32'N, 77°44'W (FIGURE 11).
4. Topographic Quadrangle(s): Maple Hill, NC 1981
5. Size: 200 acres
6. Elevation: 33 ft to 44 ft above mean sea level
7. Access: From Northeast Cape Fear River on NC 210, go 1.1 miles east on NC 210 to the intersection of SR 1520. Turn left (north) and go approximately 7 miles to the Holly Shelter Game Lands headquarters. Turn right (east) through a gate on the Game Land's Lodge Road and go 4.2 miles to the last hunter access trail (unmarked, but with pocosin trees and shrubs cut in a more or less linear corridor) just before large impoundment on right side of Lodge Road. Walk the hunter trail to the ridge, about 0.5 miles.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May 19, June 25, and July 23, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: Southwest Ridge is a weakly crescent-shaped sand body which trends east-west and is located adjacent to the northern boundary of Holly Shelter Bay. An inspection of aerial photography or the USGS topographic quadrangle shows Southwest Ridge matching a counterpart northeast ridge, thus forming an elliptic landform of the general shape and orientation of a Carolina Bay.

The ridge is composed of loose well-drained and grayish-to-pale yellow sand, except along the edges and the topographically lower western tip where this layer of sand covers dark organic materials. Elevation of the ridge is about 10-15 ft higher than the adjacent pocosin. Water table varies, and fluctuations are hampered by the presence within the soil profile of pans. The typical occurrence of a large body of sand along the southeast margin of most Carolina bays is missing from this area-- a fact which may be related to the

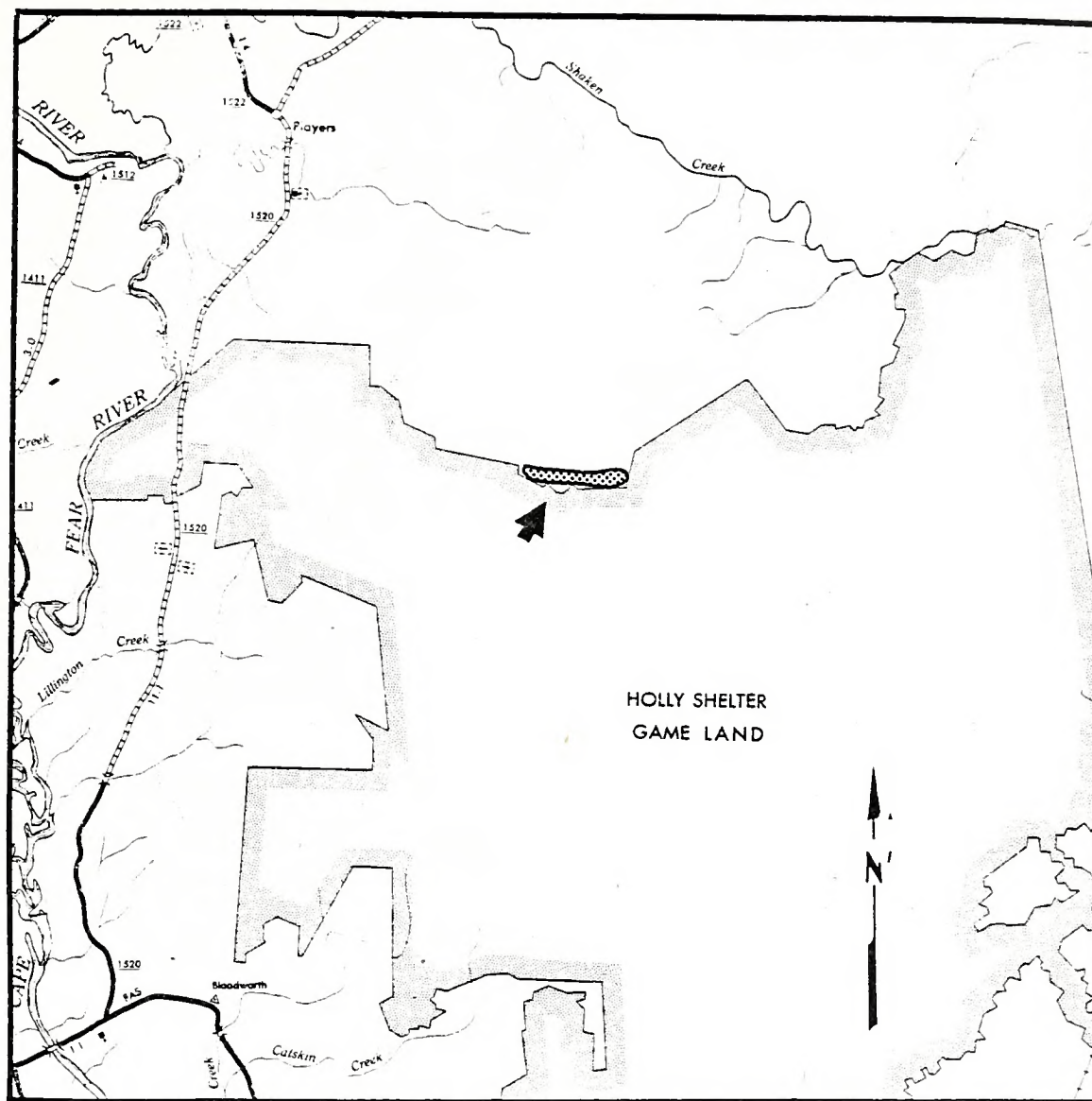


FIGURE 11. Southwest Ridge Natural Area. Map scale: 1 in. = 2 mi.

bisection of the bay by Ashes Creek. Streamflow, however, is not toward the southeast as one would logically surmise from examination of maps, but instead, is in the opposite direction.

Surrounding vegetation is mostly dense evergreen shrub pocosin beneath an open pond pine canopy on the south; on the north is a wet, incipient savanna (now mostly covered with shrubs as a result of fire prevention). Canopy species vary north of the ridge, and depending upon elevation, and hence, water regime, may be longleaf pine, pond pine, or a combination of each.

Vegetation of Southwest Ridge is predominantly open longleaf pine woods with a marginal pond pine ecotone (along with wiregrass). There are no turkey oaks present on the ridge. Ground cover is comprised of wiregrass and creeping blueberry as dominants with scattered clones or individuals of other herbaceous, or rarely, woody species. A shrub layer as well as a subcanopy are missing. Bases of the longleaf pines are not charred, thus ruling out fire as a causative agent in preventing development of woody subcanopy layers, although longleaf pine is traditionally recognized as a fire-maintained edaphic climax. Grass-stage seedlings and saplings of longleaf pine are sparse and do not show any visible and obvious colonization pattern. Dead canopy trees are also sparse, although present over much of the ridge, and they appear to have died as a result of factors other than lightning strikes.

Human occupancy of the site is presumed to be prehistoric, and site use continues to the present on a seasonal basis. Fabric-impressed, grit-tempered potsherds and cracked rock and flakes were recovered from exposed soil on the northeast counterpart of Southwest Ridge. Many of the longleaf pines show scars from the turpentine/ naval stores industry, and as late as 1954-56, the area was selectively logged. Southwest Ridge is a popular hunting area, and in addition to pedestrian access from Lodge Road south of the site, a jeep trail has been constructed from the north. (This access road was not investigated during the study.)

Detailed discussion of the Holly Shelter area is found in B. W. Wells' "Vegetation of Holly Shelter Wildlife Management Area"; N. C. Dept. Cons. and Dev., Div. Game and Inland Fisheries, Bulletin #2 (1946).

- 11B. Prose Description of Site Significance: The features of Southwest Ridge which are most distinctive to the first-time visitor are (1) the contrast in vegetation types between the extraordinarily dense pocosin and the open, park-like appearance of the ridge; (2) the lack of a shrub layer, which accentuates the height of the pines; (3) the isolation of the site; and (4) the abrupt rise in elevation, as one approaches the ridge from the south.

The combination of a relatively large and vigorous population

of the federally endangered Red-cockaded Woodpecker in a 150-year old longleaf pine stand surrounded by thousands of acres of pocosin is the primary significant feature of this natural area. Of secondary importance, larger because of the lesser status, are occurrences of Venus' fly-traps, roughleaf loosestrife, and dwarf fothergilla. The location of Southwest Ridge is unique-- there being to our knowledge, only one other large sand ridge within a major expanse of bay (located in Angola Bay in northern Pender County).

The significance of the Red-cockaded Woodpecker colony is that it is apparently in a stable condition, is thriving, and occupies a timber stand with arrested subcanopy development. The number of cavity trees per number of available longleaf pines is quite high. Owing to the inaccessibility of the ridge and the absence of logging, the colony site should continue to remain in satisfactory condition and should be preserved.

The plant community, with its absence of turkey oak, is unusual and probably should be considered an anomalous variant of the longleaf pine/turkey oak/wire grass community type. Isolation of the ridge may be the limiting factor for turkey oak, since a few scattered plants of that species were found on the northeast counterpart ridge. Moreover, the dense ground cover of creeping blueberry and wire grass on Southwest Ridge, together with infrequent fires, may account for the absence of turkey oak and also the scarcity of longleaf pine seedlings.

12. Significance Summary: (see TABLE 4)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 32%, Public 68%, Unknown 0%

14. Number of Owners: 3

15. Name(s) of Owner(s) and/or Custodian(s) (with addresses, phone numbers, and other pertinent information):

- (1) University of North Carolina, Board of Trustees of the Endowment Fund (Mrs. Grace Wagoner, University Property Office, 134 East Franklin Street (165-A), Chapel Hill, NC 27514 (919/966-3296)
- (2) W. F. Sledge, P. O. Box 523, Whiteville, NC 28742 (919/642-7029)
- (3) Jabe Six Properties, Ltd., P. O. Box 1806, Wilmington, NC 28402 (James Z. Godwin/E. W. Godwin's Sons Lumber Co. 919/762-7747)

16. Name(s) of Knowledgeable Person(s) (with addresses, phone numbers, and other pertinent information).

- (1) Charles "Vic" French, Wildlife Management Technician II, Route 1, Box 222, Burgaw, NC 28425. Mr. French is Holly Shelter Game Lands Manager, and he has a thorough knowledge of the property and surrounding areas.

TABLE 4. Significance summary of Southwest Ridge Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
High quality terrestrial community	1	Longleaf pine - wiregrass sand ridge	Isolated ridge with 150-year old longleaf pines
Endangered or threatened sp.	2a	Venus' fly-trap	Sparse population in ecotone
Endangered or threatened sp.	2b	Rough-leaf loosestrife	Sparse population in ecotone
Endangered or threatened sp.	2c	Dwarf fothergilla	Extremely large population at west end of ridge
Endangered or threatened sp.	2d	Red-cockaded Woodpecker	Fifteen active, 11 inactive, and 1 enlarged cavity. Ten adults seen; population appears stable

17. Attitude of Owner or Custodian Toward Preservation (contacted?): Jabe Six Properties, Ltd., was contacted on July 24, 1981. The owners expressed an interest to sell their 1/6 undivided interest in the 800 ac parcel which includes Southwest Ridge.

Mr. W. F. Sledge was contacted on July 27, 1981 regarding his 1/2 interest in the 90 ac tract at the east end of Southwest Ridge. He also expressed a favorable attitude toward sale of the property, or other disposition of his share to a conservation foundation.

18. Uses of Natural Area: The area was last selectively logged between 1954 and 1956. Evidence is present that indicates use, formerly, of the area for gathering naval stores. Historically and at present, the area is used mainly for deer hunting. The ridge might have some archaeological significance.
19. Uses of Surrounding Land: Wildland 100%
20. Preservation Status: Category 3, 68%; Category 6, 32%
21. Regulatory Protection in Force: No regulatory protections in effect
22. Threats: No major threats to the area at this time except that possible timber harvest of some of the trees is feasible during very dry weather or when access from the north is provided. A deed from 1954 indicates that timber rights are held separately for the western portion of the tract.
23. Management and Preservation Recommendation: (1) Improved access by pedestrian trail, (2) abandonment of jeep trail from north, (3) plan for control burns, (4) discouragement for game food-plot development, (5) prohibition of logging, and (6) acquisition for potential inclusion into Holly Shelter Game Lands with regulated hunter access and utilization.

Natural Characteristics Summary

- 24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris/Aristida stricta-Vaccinium crassifolium
Community cover type: Pinus palustris
General habitat feature: Longleaf pine sand ridge
Average canopy height: 50-60 ft
Estimated age of canopy trees: 150 yrs (tree ring counts of 146, 149, and 154 yrs from increment borings)
Canopy cover: Open
Estimated size of community: 200 ac
Successional stage: Edaphic climax
Sere type: Psammosere
Common canopy species in community cover or community type (but not dominant): None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): None
Common herb stratum species in community cover or community type (but not dominant): Amorpha herbacea, Pteridium aquilinum, Chrysopsis graminifolia, Pterocaulon pycnostachyum

- 24B. Soil Summary (by community type)
Soil series: Mandorin and Alpin
Soil classification: Mandorin: Fine sand, mixed acidic, humic; Alpin: Fine sand, mixed acidic, thermic, coated typic, quartzpsamments
Soil association: Alpin-Mandorin
pH class: Mandorin: Extremely acid to neutral; Alpin: Extremely acid to neutral
Moisture class: Mandorin: Somewhat poorly drained; Alpin: Excessively drained
Source of information: Description prepared from site analyses on July 23, 1981 by W. L. Barnhill, Soil Scientist and assisted by John Ray and Jay Milam, Pender County SCS Office.
Other notes: Barnhill cautioned that the pH readings of 7.0 may have been faulty because of the techniques used during the field analyses. Slight acidity was expected.
- 24C. Hydrology Summary (by community type)
Hydrologic system: Terrestrial
Hydrologic subsystem: Mesic (Mandorin) to Dry-xeric (Alpin)
Water chemistry: Fresh
Water regime: not applicable
Drainage class: Somewhat poorly to excessively drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly to excessively drained elevated sand ridge surrounded by poorly drained muck and mucky sands.
- 24D. Topography Summary
Landform: Sand ridge with Carolina Bay rim characteristics
Shelter: Deeply sheltered
Aspect: North - South
Slope angle: Gently sloping (2-6°)
Profile: Convex
Surface patterns: Smooth
Position: Entire slope
25. Physiographic Characterization of Natural Area: A fire-maintained climax community of a psammose on an isolated sand ridge in the Holly Shelter Bay. The ridge drains toward the Northeast Cape Fear River and is underlain by Eocene Castle Hayne limestone in the Embayed Section of the Coastal Plain province of the Atlantic Plain region.
Geological Formation: Eocene Castle Hayne limestone overlain by Quaternary sands (Renfro and Feray 1978).
Geological Formation Age: Eocene formation: 40-50 million yrs; Quaternary sands: 6,000 to 1 million yrs.

References Cited: Renfro, H. B. and Dan E. Feray. 1978. Geological Highway Map of the Mid-Atlantic Region. American Association of Petroleum Geologists. Map No. 4.

26. Summary - Endangered and Threatened Species

(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: Less than 50

Size or maturity of individuals: Small and scattered; probably declining population size due to minimum site disturbance, infrequent fires, and shading by pocosin shrubs.

Phenology of population: Vegetative: 40%; Flowering 60%; Fruiting: Not determined

General vigor of population: Mostly mature plants; little reproduction

Disturbance or threats to population: Natural invasion and growth of evergreen shrubs

Habitat characteristics:

Plant community: Disturbed ecotonal margin between longleaf pine ridge and evergreen shrub pocosin

Topography: 1% slope

Soil series: Slumped sand over Pamlico or Murville muck

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: Plants: Clethra alnifolia, Cyrilla racemiflora, Vaccinium crassifolium, Pinus serotina, Gaylussacia frondosa, Ilex glabra, Ilex coriacea, Persea borbonia, Magnolia virginiana, Drosera intermedia, Aristida stricta, Xyris baldwiniana. Animals: See attached master species lists.

(2) Name of species: Fothergilla gardenii (HAMAMELIDACEAE) Dwarf fothergilla

Species legal status and authority: NC threatened peripheral (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: Several thousand

Size or maturity of individuals: Mature plants 1-2 ft tall

Phenology of population: Vegetative: 30%; Flowering 70%; Fruiting 50%

General vigor of population: Excellent

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Ecotone between longleaf pine ridge and evergreen shrub pocosin

Topography: Level

Soil series: Mandorin

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: Plants: Pinus palustris, Pinus serotina, Clethra alnifolia, Vaccinium crassifolium, Aristida stricta, Vaccinium tenellum, Ilex glabra, Myrica cerifera var. pumila. Animals: See attached master species lists.

(3) Name of species: Lysimachia asperulaefolia (PRIMULACEAE) Rough-leaf loosestrife

Species legal status and authority: NC endangered endemic (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 23

Size or maturity of individuals: Approximately 1 ft in height; mature

Phenology of population: Vegetative: 75%; Flowering 25%; Fruiting 25%

General vigor of population: Fair

Disturbance or threats to population: Natural invasion and growth of evergreen shrubs. Population is located in a disturbed area of hunter trail. At this site, plants probably require disturbance by man for survival.

Habitat characteristics:

Plant community: Open, chopped area of hunter access trail in a pond pine pocosin

Topography: Level

Soil series: Pamlico or Murville muck

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: Plants: Pinus serotina

Ilex glabra, Ilex coriacea, Ilex americana, Magnolia virginiana

Persea borbonia, Zenobia pulverulenta, Cassandra calyculata, Smilax

laurifolia, Drosera intermedia. Animals: See attached master species lists.

(4) Name of species: Red-cockaded Woodpecker

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: 15 active cavities, 10 adults seen

Size or maturity of individuals: Adult

Phenology of population: Not applicable

General vigor of population: Apparently healthy and reproducing

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Longleaf pine/wire grass--creeping blueberry

Topography: Sloping to level

Soil series: Mandarin and Alpin

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plant and animal species present: See attached master species lists.

(See FIGURE 12 for detailed map of endangered and threatened species locations.)

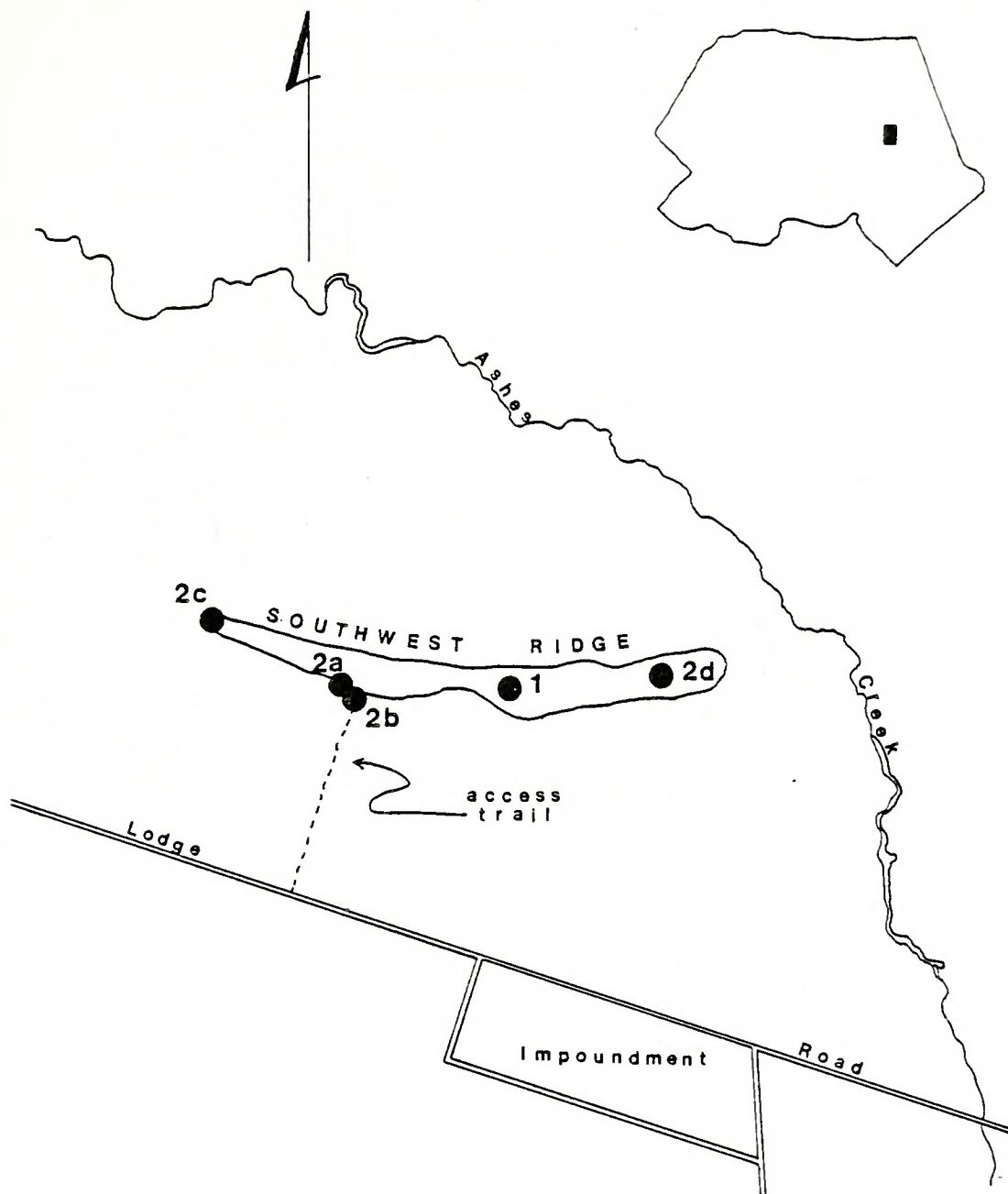


FIGURE 12. Significant features of Southwest Ridge Natural Area.
 Code: (1) High quality terrestrial community, (2) Endangered or
 threatened species. Map scale: 1 in. = 2,000 ft.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

AQUIFOLIACEAE

Ilex glabra

ASTERACEAE

Carduus repandus

Carphephorus bellidifolius

Chrysopsis graminifolia

Liatris graminifolia

Pterocaulon pycnostachyum

BLECHNACEAE

Woodwardia virginica

CLETHRACEAE

Clethra alnifolia

CONVOLVULACEAE

Bonamia patens var. *angustifolia*

CYRILLACEAE

Cyrilla racemiflora

DIONAEACEAE

Dionaea muscipula

DROSERACEAE

Drosera capillaris

D. intermedia

ERICACEAE

Gaylussacia frondosa

Leucothoe ligustrina

Vaccinium crassifolium

V. tenellum

EUPHORBIACEAE

Cnidoscolus stimulosus

FABACEAE

Amorpha herbacea

Stylosanthes biflora

HAMAMELIDACEAE

Fothergilla gardenii

HYPERICACEAE

Hypericum reductum

IRIDACEAE

Sisyrinchium arenicola

LAURACEAE

Persea borbonia

MAGNOLIACEAE

Magnolia virginiana

MELASTOMATACEAE

Rhexia alifanus

R. mariana

MYRICACEAE

Myrica cerifera

Myrica cerifera var. pumila
 M. heterophylla
 PINACEAE
 Pinus palustris
 P. serotina
 POACEAE
 Andropogon scoparius
 A. virginicus
 Aristida stricta
 Panicum sp.
 PRIMULACEAE
 Lysimachia asperulaefolia
 PTERIDACEAE
 Pteridium aquilinum
 SARRACENIACEAE
 Sarracenia flava
 S. purpurea
 THEACEAE
 Gordonia lasianthus
 XYRIDACEAE
 Xyris sp.

AMPHIBIANS

Southern Toad
 Oak Toad

REPTILES

Eastern Box Turtle
 Green Anole
 Six-lined Racerunner
 Ground Skink
 Broad-headed Skink
 Northern Black Racer
 Corn Snake

BIRDS

Key

PR = Permanent resident
 SR = Summer resident
 WR = Winter resident
 T = Transient, spring or fall
 PV, SV, WV = Visitor; permanent, summer, or winter
 * = Breeding or suspected breeding at site

Turkey Vulture	PV
Bobwhite	PR*
Mourning Dove	PV
Chimney Swift	SV

Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PV
Downy Woodpecker	PR*
Red-cockaded Woodpecker	PR*
Eastern Kingbird	SR*
Crested Flycatcher	SR*
Eastern Wood Pewee	SR*
Blue Jay	PV
Common Crow	PV
Fish Crow	PV
Carolina Chickadee	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Gray Catbird	SR*
Eastern Bluebird	PR*
Starling	PV
Pine Warbler	PR*
Prairie Warbler	SV
Common Yellowthroat	SR*
Yellow-breasted Chat	SV
Eastern Meadowlark	PV
Common Grackle	PV
Brown-headed Cowbird	PV
Summer Tanager	SR*
Cardinal	PR*
Blue Grosbeak	SV
Indigo Bunting	SV
Rufous-sided Towhee	PR*
Field Sparrow	WV

MAMMALS

Whitetail Deer
Black Bear

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Lanier Quarry Savanna
2. County: Pender
3. Location: Lanier Quarry Savanna is located southeast of Maple Hill and south of NC 50, 0.3 miles, and southeast of SR 1532, approximately 0.4 miles. The site is reached by dirt road which turns left (east), off SR 1532 at a small cemetery. Coordinates: 34°38'N, 77°40'W (FIGURE 13).
4. Topographic Quadrangle(s): Maple Hill, NC 1981; Maple Hill, SW, NC (1981)
5. Size: Ca. 140 ac
6. Elevation: 18 ft to 24 ft above mean sea level
7. Access: By private road from SR 1532, proceed 2.2 mi. southeast of Maple Hill to the intersection of SR 1532, turn right (south) and go 0.3 mi. to private road on left by cemetery. Turn on dirt road and follow this road past quarry to an open, disturbed area, eventually to be mined. The central part of savanna is then located west of this clearing, but parts of woodlands are included in natural area.
8. Names of investigators: S. W. Leonard
P. O. Box 3475
Wilmington, NC 28406
Ricky Davis
126 Duncansby Court
Cary, NC 27511
9. Date(s) of Investigation: May-October, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: Lanier Quarry Savanna is a flat expanse with scattered longleaf pines surrounded by the swamp of Sandy Run Creek and small, wooded tributary drainages. The savanna is reportedly maintained by local landowners who periodically burn the area in order to promote growth of insectivorous plants, which they harvest for local sale. During the investigation of the savanna, peripheral woodlands were found to contain several rare species of interest, and therefore, the natural area has been expanded from the initial site study by Alan S. Weakley in August 1980.

In addition to the botanical significance of the natural area, and perhaps the major contributing factor to the uniqueness of the flora is the presence of underlying strata of a weakly consolidated, fossiliferous limestone. Overburden is relatively thin, generally being less than 10 ft. Soil pH was tested by Lamotte kit found to be in the range of 7.5 to 8.0. No other savannas are known in Pender County which contain comparable flora and have these soil conditions.

although nearby areas in Onslow County are similar.

The savanna contains a profusion of herbaceous plants, and is dominated by the grass, Ctenium aromaticum. Large numbers of pitcher plants are present, and in certain areas of the savanna, Venus' fly-traps. The peak of the flowering season occurs in late spring and early summer and again in early autumn.

- 11B. Prose Description of Site Significance: Physical and biological features are important site characteristics. According to personal communication between Lee Otte and Alan Weakley, the site is an important type location for marine Miocene fauna as well as an "excellent example of fossiliferous Castle Hayne limestone."

Significant botanical components are Venus' fly-traps, pitcher plants, Cooley's meadow-rue, the recently-discovered prairie onion, Allium stellatum, and a potentially undescribed species of the family Apiaceae. The site may be the most important representative example of a Pinus palustris/Ctenium aromaticum savanna in North Carolina.

12. Significance Summary: (See TABLE 5)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%, Public 0%, Unknown 0%
14. Number of Owners: 13, possibly others
15. Name(s) of owner(s) and/or custodian(s) (with address, phone numbers, and other pertinent information): S. A. Lanier; Heirs of Christine James; Boyce J. Williams; Mildred James; Heirs of Hannah James; Coy A. Lee; Theodore Lee; Preston Marshburn; Terry Lee and Leora Lee; Linbert and Frances Shepard; Isaac and Mildred Lee; June Williams heirs; John Shepard, Jr., Evelyn Shepard Lee, Mamie Shepard Watkins, Luberta Shepard Walker, Viola Shepard Hand; Sampson James, Bertie Wheeler, and Bert L. Wheeler; and Marvin L. Goodson.
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Alan S. Weakley, Duke University, Department of Botany, Durham, NC
17. Attitude of owner or custodian toward preservation (contacted?): Two of the owners who are utilizing the limestone resource for agricultural lime were contacted (S. A. Lanier and Marvin Goodson). A plant rescue effort was arranged for removal of some of the plants. Owners of the main part of the savanna were not contacted. Most of these owners reside in the Maple Hill area.
18. Uses of natural area: The chief uses are related to exploitation of insectivorous plant population and limestone mining.

TABLE 5. Significance summary of Lanier Quarry Savanna Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
Endangered or threatened sp.	1a	Venus' fly-trap	Large population but exploited at this site
Endangered or threatened sp.	1b	Prairie onion	New species to NC, disjunct from Midwest
Endangered or threatened sp.	1c	Cooley's meadow-rue	Small population, endemic to southeast NC, possibly in GA and FL
Endangered or threatened sp.	1d	Carolina parnassia	Scattered over much of area, but small colonies
Endangered or threatened sp.	1e	Scale-leaf gerardia	Small colonies over much of savanna; seldom found elsewhere
Unusual species assemblage	2	A potential new sp. of Oxypolis growing with 1b, 1c, and 1e	Unusual occurrence of basic soil conditions in savanna habitat
High floristic diversity	3	Large population of insectivorous plants	Similar to Holly Shelter savannas, but with different soil conditions

19. Uses of Surrounding Land: Wildland 80%, Agricultural land 10%, Developed 10%
20. Preservation Status: Category 6, 100%
21. Regulatory Protections in Force: No regulatory protections known
22. Threats: Potential for limestone mining, residential development or farming.
23. Management and Preservation Recommendation: Change of ownership through donations of land or acquisition will require an annual or biennial controlled burn to keep the savanna in its present condition. At the present time, this management alternative is achieved, albeit for different purposes (to sustain an insectivorous plant population for small-scale harvest). There are no major threats for timber harvest since the board-footage per acre is small; however, pine plantation would probably alter the site characteristics, and thus is not recommended. Due to the large number of landowners, any change in the "status quo" of the site may have serious implications and lead toward loss of habitat. Acquisition of site seems to be the most urgent need, although protection from insectivorous plant exploitation would be impossible. However, protection of mineral resource and therefore site integrity, with above-stated limitations, would then be possible.

Natural Characteristics Summary

- 24A. Vegetation - Biotic Community Summary:
- Community type: Pinus palustris/Ctenium aromaticum
- Community cover type: Pinus palustris
- General habitat feature: Savanna
- Average canopy height: 50 ft
- Estimated age of canopy trees: 50-75 years
- Canopy cover: Open
- Estimated size of community: 40 ac of contiguous savanna; 30 ac of peripheral savanna; 20 ac of disturbed area; 50 ac of miscellaneous timberland
- Successional stage: Fire-maintained climax
- Sere type: Variant of psammosere
- Common canopy species in community cover or community type (but not dominant): None
- Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): None
- Common herb stratum species in community cover or community type (but not dominant): Centella asiatica, Chondrophora nudata, Chrysopsis graminifolia, Marshallia graminifolia, Eupatorium recurvans, Drosera spp., Rhexia spp., Melanthium virginicum, Zigadenus glaberrimus, Tofieldia racemosa, Habenaria spp., Aristida spp., Polygala spp., Lycopodium carolinianum

- 24B. Soil Summary (by community type)
Soil series: Invershiel and Meggett
Soil classification: Spodosols
Soil association: Invershiel-Meggett
pH class: Frequently 7.5 or higher; localized conditions with slightly acidic soils or acidic surface horizons, seldom lower than pH of 6.
Moisture class: Well drained to poorly drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).
- 24C. Hydrology Summary (by community type)
Hydrologic system: Palustrine
Hydrologic subsystem: Interaqueous
Water chemistry: Fresh
Water regime: Saturated
Drainage class: Somewhat poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly drained flat to gently sloping savanna over calcareous substrates of the Invershiel-Meggett soil association.
- 24D. Topography Summary
Landform: Terrace; flat
Shelter: Open
Aspect: None
Slope Angle: Nearly level with slight slope to the south (0-2°)
Profile: Flat
Surface patterns: Nearly smooth
Position: Not applicable
25. Physiographic characterization of natural area: A fire-maintained climax community of a basic psammosere on a flat to gently sloping terrace of Sandy Run Swamp, a tributary of the Northeast Cape Fear River. The terrace is underlain by Eocene Castle Hayne limestone in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Eocene Castle Hayne limestone
Geological Formation age: 40-50 million years
26. Summary - Endangered and threatened species
(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: several hundred
Size or maturity of individuals: Various; immature to mature
Phenology of population: Vegetative: 60%; Flowering: 40%; Fruiting: not determined
General vigor of population: Very vigorous
Disturbance or threats to population: Limestone mining, local collecting
Habitat characteristics:
Plant community: Longleaf pine savanna

Topography: Flat

Soil series: Invershiel and/or Meggett

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Plants: Drosera capillaris, Drosera leucantha, Polygala lutea, Polygala cruciata, Rhexia mariana, Rhexia alifanus, Habenaria spp., Marshallia graminifolia; Animals: see attached master species lists.

(2) Name of species: (Proposed, new to North Carolina) Allium stellatum (LILIACEAE) Prairie onion

Species legal status and authority: None

Number of populations on site: 2

Number of individuals per population: 10 and 40

Size or maturity of individuals: Mature

Phenology of population: Vegetative: Not determined; Flowering: 100%; Fruiting: 80%

General vigor of population: Very vigorous to fair

Disturbance or threats to population: The larger population subject to eradication if road to quarry is widened.

Habitat characteristics:

Plant community: Ecotonal margin between wiregrass savanna and mixed hardwood/cypress drainage; also mixed hardwoods

Topography: Level to slightly concave

Soil series: Invershiel and/or Meggett

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Agalinis purpurea, Oxypolis ternata, Andropogon sp., Aristida stricta, Zigadenus glaberrimus, Coreopsis helianthoides, Helenium autumnale; Animals: see attached master species lists.

(3) Name of species: Thalictrum cooleyi (RANUNCULACEAE) Cooley's meadow rue

Species legal status and authority: NC endangered endemic (Cooper et al. 1977)

Number of populations on site: 1

Number of individuals per population: Ca. 25

Size or maturity of individuals: Immature and mature

Phenology of population: Vegetative: 60%; Flowering: 40%; Fruiting: not determined

General vigor of population: Fair

Disturbance or threats to population: Shading

Habitat characteristics:

Plant community: Ecotone of wiregrass savanna and mixed hardwoods

Topography: Flat to slightly concave

Soil series: Invershiel and/or Meggett

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Plants: Carex sp.,

Elephantopus carolinianus, Rosa palustris, Myrica cerifera,

Asclepias lanceolata; Animals: see attached master species lists.

(4) Name of species: Parnassia caroliniana (SAXIFRAGACEAE) Carolina
parnassia

Species legal status and authority: NC threatened (Cooper et al. 1977)

Number of populations on site: 1, possibly others

Number of individuals per population: 40

Size or maturity of individuals: Mature

Phenology of population: Vegetative: 100%

General vigor of population: Fair

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Longleaf pine/wiregrass savanna

Topography: Level

Soil series: Invershiel and/or Meggett

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Plants: Andropogon sp.

Asclepias lanceolata, Marshallia graminifolia, Aster sp., Polygala ramosa, Dichromena latifolia; Animals: see attached master species lists.

(5) Name of species: Agalinis aphylla (SCROPHULARIACEAE) Scale
leaf gerardia

Species legal status and authority: NC endangered peripheral (Cooper
et al. 1977)

Number of populations on site: 1

Number of individuals per population: 25

Size or maturity of individuals: Mature

Phenology of population: Vegetative: 0%; Flowering: 20%; Fruiting: 80%

General vigor of population: Vigorous

Disturbance or threats to population: None

Habitat characteristics:

Plant community: Wiregrass savanna

Topography: Level

Soil series: Invershiel and/or Meggett

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River

Other plants and animal species present: Plants: Agalinis purpurea,

Eryngium integrifolium, Coreopsis helianthoides, Helenium autumnale,

Oxypolis ternata, Andropogon sp., Allium stellatum, Zigadenus glaberrimus;

Animals: see attached master species lists.

(6) Note: Late in the survey, during a brief inspection of the area,
numerous plants of Agalinis fasciculata were seen in the general area.
Population and habitat characteristics were not determined, due to time
constraints.

(See FIGURE 14 for detailed map of endangered and threatened species locations.)

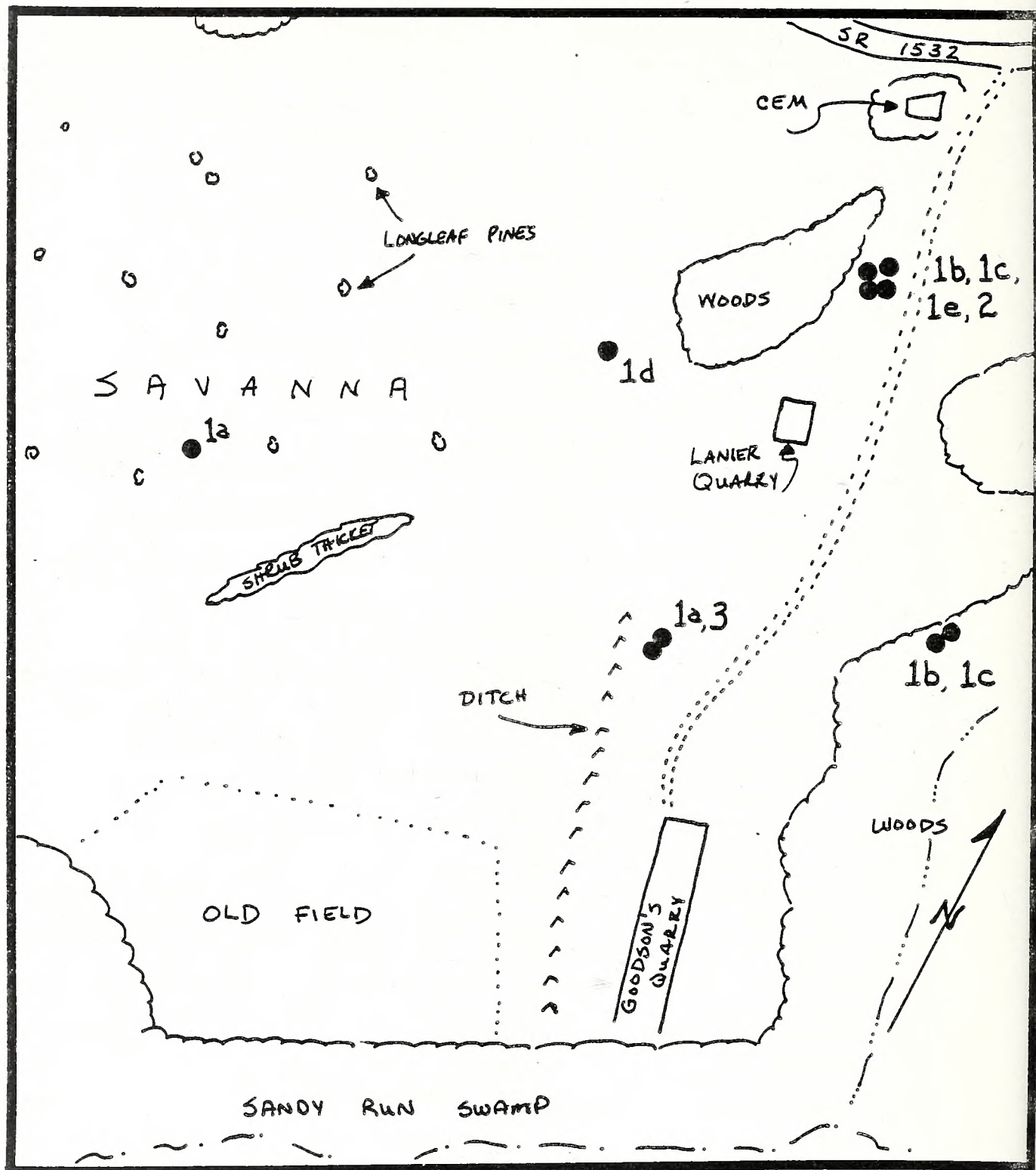


FIGURE 14. Significant features of Lanier Quarry Savanna Natural Area. Code: (1) Endangered or threatened species, (2) Unusual species assemblage, (3) High floristic diversity. Map scale: 1 in = 600 ft.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE

Acer rubrum

AMARYLLIDACEAE

Hypoxis hirsuta

H. micrantha

ANACARDIACEAE

Rhus copallina

R. radicans

APIACEAE

Centella asiatica

Eryngium integrifolium

E. yuccifolium

Hydrocotyle umbellata

Oxypolis filiformis

O. ternata

AQUIFOLIACEAE

Ilex coriacea

I. glabra

ASCLEPIADACEAE

Asclepias lanceolata

ASTERACEAE

Aster linariifolius

A. novi-belgii

Baccharis halimifolia

Balduina uniflora

Cacalia lanceolata

Carduus repandus

Carphephorus tomentosus

Chaptalia tomentosa

Chondrophora nudata

Chrysopsis graminifolia

Conyza canadensis

Coreopsis angustifolia

C. falcata

C. helianthoides

C. lanceolata

Elephantopus nudatus

Eupatorium capillifolium

E. coelestinum

E. recurvans

E. rotundifolium

Euthamia tenuifolia

Helenium autumnale

Helianthus angustifolius

H. heterophyllus

Krigia virginica

Liatris graminifolia
 L. spicata var. resinosa
 Marshallia graminifolia
 Mikania scandens
 Pluchea camphorata
 Pyrrhopappus carolinianus
 Solidago stricta
 Trilisa paniculata
 Vernonia angustifolia
 BIGNONIACEAE
 Campsis radicans
 BLECHNACEAE
 Woodwardia virginica
 BROMELIACEAE
 Tillandsia usneoides
 CAMPANULACEAE
 Lobelia elongata
 L. nuttallii
 CLETHRACEAE
 Clethra alnifolia
 CYPERACEAE
 Carex walteriana
 Dichromena latifolia
 Eleocharis obtusa
 Fuirena squarrosa
 Psilocarya nitens
 Rhynchospora baldwinii
 R. cephalantha
 R. fascicularis
 Scleria pauciflora
 S. reticularis
 CYRILLACEAE
 Cyrilla racemiflora
 DIAPENSIACEAE
 Pyxidantha barbulata
 DIONAEACEAE
 Dionaea muscipula
 DROSERACEAE
 Drosera capillaris
 D. intermedia
 D. leucantha
 ERICACEAE
 Gaylussacia dumosa
 Kalmia angustifolia var. caroliniana
 Lyonia ligustrina
 Rhododendron atlanticum
 Vaccinium crassifolium
 ERIOCAULACEAE
 Eriocaulon decangulare
 Lachnocaulon anceps

FABACEAE

Baptisia tinctoria
Cassia fasciculata
Centrosema virginianum
Crotalaria purshii
Desmodium lineatum
D. tenuifolium
Galactia volubilis
Stylocanthes biflora
Tephrosia spicata
Zornia bracteata

FAGACEAE

Quercus nigra

GENTIANACEAE

Sabatia brachiata
S. campanulata
S. difformis

HAEMODORACEAE

Lachnanthes caroliniana

HALORAGACEAE

Proserpinaca palustris

HAMAMELIDACEAE

Liquidambar styraciflua

HYPERICACEAE

Hypericum cistifolium
H. galioides
H. stans

IRIDACEAE

Iris tridentata
Sisyrinchium mucronatum var. atlanticum

LAMIACEAE

Pycnanthemum flexuosum
Scutellaria integrifolia

LAURACEAE

Persea borbonia

LENTIBULARIACEAE

Pinguicula caerulea

LILIACEAE

Aletris farinosa
Allium stellatum
Lilium catesbaei
Melanthium virginicum
Pleea tenuifolia
Smilax glauca
S. laurifolia
Tofieldia racemosa
Zigadenus glaberrimus

LOGANIACEAE

Gelsemium sempervirens
Mitreola petiolata

LORANTHACEAE

Phoradendron serotinum

LYCOPODIACEAE

Lycopodium alopecuriodes

L. carolinianum

MAGNOLIACEAE

Liriodendron tulipifera

Magnolia virginiana

MELASTOMATACEAE

Rhexia alifanus

R. lutea

R. mariana

R. petiolata

MYRICACEAE

Myrica cerifera

M. cerifera var. pumila

M. heterophylla

NYSSACEAE

Nyssa biflora

ONAGRACEAE

Ludwigia linearis

L. palustris

ORCHIDACEAE

Calopogon pallidus

C. pulchellus

Cleistes divaricata

Habenaria blephariglottis

H. ciliaris

H. clavellata

H. cristata

Pogonia ophioglossoides

Spiranthes cernua

OSMUNDACEAE

Osmunda cinnamomea

O. regalis var. spectabilis

PINACEAE

Pinus palustris

P. serotina

P. taeda

POACEAE

Agrostis hyemalis

Andropogon scoparius

A. virginicus

Anthraenantia rufa

Aristida longispica

A. stricta

A. virgata

Arundinaria gigantea

Ctenium aromaticum

Erianthus giganteus

Muhlenbergia expansa
 Panicum aciculare
 P. tenue
 P. sp.
 Paspalum dilatatum
 P. praecox
 POLYGALACEAE
 Polygala brevifolia
 P. cruciata
 P. cymosa
 P. hookeri
 P. lutea
 P. ramosa
 POLYPODIACEAE
 Polypodium polypodioides
 PRIMULACEAE
 Lysimachia loomsii
 PTERIDACEAE
 Pteridium aquilinum
 RANUNCULACEAE
 Thalictrum cooleyii
 ROSACEAE
 Sorbus arbutifolia
 SALICACEAE
 Salix caroliniana
 SARRACENIACEAE
 Sarracenia flava
 S. purpurea
 SAXIFRAGACEAE
 Itea virginica
 Parnassia caroliniana
 SCROPHULARIACEAE
 Agalinis aphylla
 A. purpurea
 Linaria canadensis
 Penstemon laevigatus
 Seymeria cassioides
 SYMPLOCACEAE
 Symplocos tinctoria
 TYPHACEAE
 Typha domingensis
 VERBENACEAE
 Lippia nodiflora
 VIOLACEAE
 Viola lanceolata
 TAXODIACEAE
 Taxodium ascendens
 T. distichum
 XYRIDACEAE
 Xyris baldwiniana
 X. brevifolia
 X. caroliniana

AMPHIBIANS

Southern Toad
Oak Toad

REPTILES

Eastern Box Turtle

BIRDS

Key

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Turkey Vulture	PV
Black Vulture	PV
Red-tailed Hawk	PV
Bobwhite	PR*
Mourning Dove	PR*
Chimney Swift	SV
Common Flicker	PR*
Red-bellied Woodpecker	PR*
Red-headed Woodpecker	PR*
Downy Woodpecker	PR*
Eastern Kingbird	SR*
Crested Flycatcher	SR*
Eastern Wood Pewee	SR*
Purple Martin	SV
Blue Jay	PV
Common Crow	PV
Fish Crow	PV
Carolina Chickadee	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Brown Thrasher	PR*
Eastern Bluebird	PR*
Starling	PV
White-eyed Vireo	SR*
Pine Warbler	PR*
Prairie Warbler	SR*
Common Yellowthroat	PR*
Eastern Meadowlark	PR*
Orchard Oriole	SR*
Common Grackle	PR*

Summer Tanager
Cardinal
Blue Grosbeak
Rufous-sided Towhee
Field Sparrow

SR*
PR*
SR*
PR*
PR*

MAMMALS

Raccoon
Eastern Cottontail
Whitetail Deer

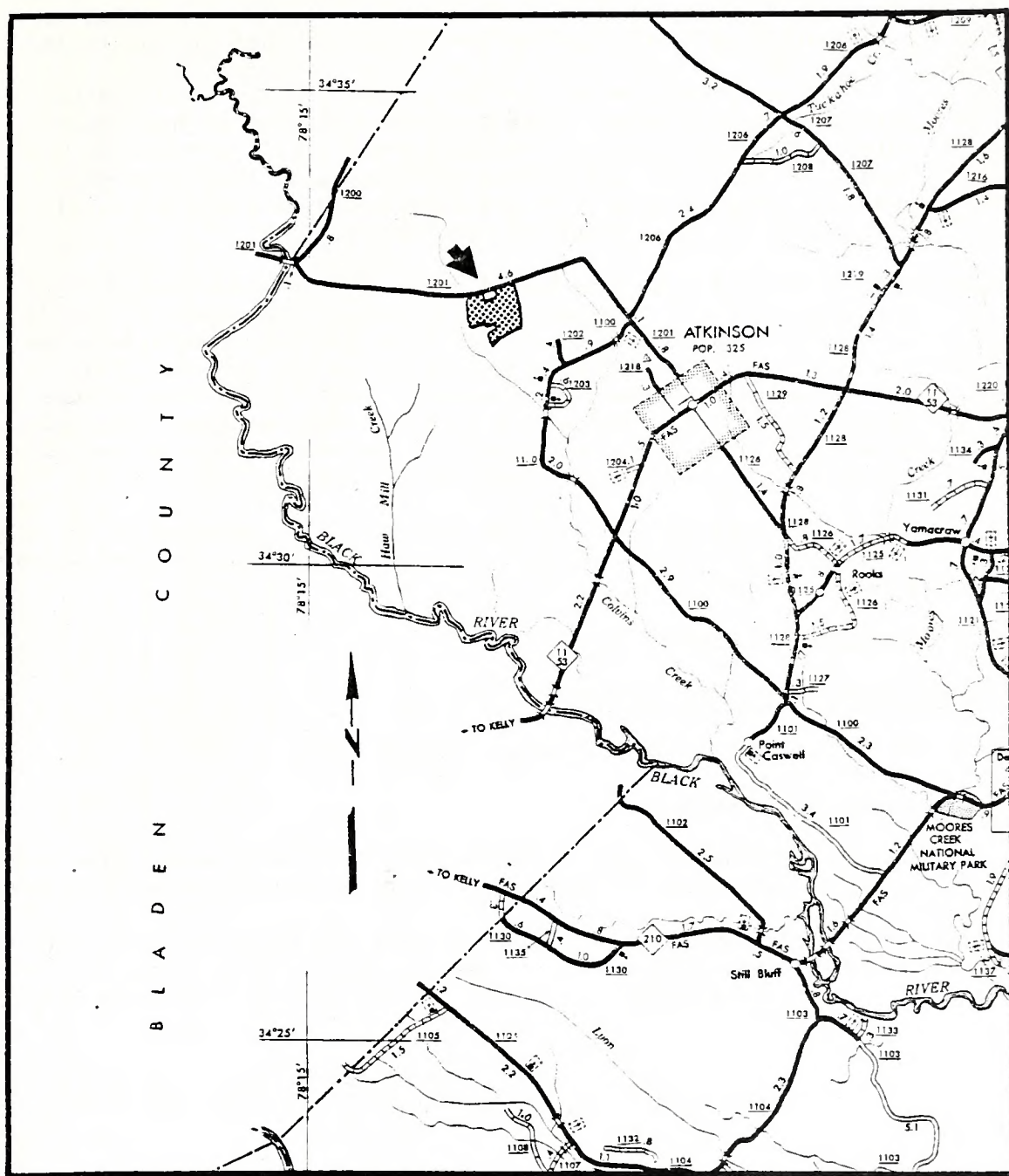
NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Jones Creek Savanna
2. County: Pender
3. Location: The savanna is located on the south side of SR 1201 in the northwestern part of the county, northwest of Atkinson, about 3 miles by road, and on the east side of the drainage of Jones Creek. Coordinates: 34°32'N, 78°13'W (FIGURE 15).
4. Topographic Quadrangle: Atkinson, NC 1955 (15' series)
5. Size: 350 ac
6. Elevation: 60 ft to 75 ft above mean sea level
7. Access: By paved road (SR 1201) and private driveway; site is approximately 2 miles east of Black River.
8. Names of investigators: S. W. Leonard Ricky Davis
 P. O. Box 3475 126 Duncansby Court
 Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May-September 1981
10. Priority Rating: High
- 11A. Prose Description of Site: The Jones Creek Savanna is part of a 9,000 acre tract, privately owned, between SR 1201 and NC 53 on the east side of the Black River. The savanna has been managed for several years for timber and wildlife-- the owner being aware of the significant features herein described. Wildlife food plots have been strategically located on the property, and some of these are included within the boundaries of the natural area. Although the preponderance of the tract is comprised of longleaf pine, loblolly pine, and some pond pine timber, smaller habitats of mixed pine-hardwoods and drainage ditches and pocosin are also present.

To the west of the site is a large undulating tract of sloughs and ridges which were formed by channel meandering of Black River. North, east, and southeast of the tract are agricultural lands and other tracts of pine timber, but none of the woodlands have been managed with the intensity and care as the Jones Creek tract.

Jones Creek Savanna is located near the western contact of the Lumbee-Johns-Kalmia soil association with the Lynn Haven-Leon-Kureb association. The topography is flat to gently sloping and poorly drained. The major feature of the site is a vigorous population of



the federally endangered Red-cockaded Woodpecker. Suitable habitat also occurs outside the boundaries of the natural area, which was here restricted to include the better part of open savanna lands.

On the upland portions of the property, and over all of the delineated natural area, there is low probability of prehistoric cultural material; however, the ridges and bluffs adjacent to Black River were utilized, and further archaeological investigations in this area may prove to be significant. Therefore, the boundaries, as identified, may need revision in the future.

- 11B. Prose Description of Site Significance: Three biological features of Jones Creek savanna were recorded: Red-cockaded Woodpeckers, Bachman's Sparrow, and Venus' fly-traps. The site is given additional consideration and higher rank because of protected status and excellent land management by the owner. Furthermore, the total holdings of the tract, comprising almost 10,000 acres of diverse communities, ranging from riverine swamp to high flatwoods merits placement as one of Pender County's more significant natural areas.

Field work was concentrated in the savanna portions of the property and subsequent investigations may reveal additional acreages which need to be described.

12. Significance Summary (See TABLE 6)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%
14. Number of Owners: 1
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Owner prefers to remain anonymous.
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): See 15; also Lance Peacock, The Nature Conservancy, Raleigh, and Merrill Lynch, NC Natural Heritage Program, Raleigh.
17. Attitude of owner or custodian toward preservation (contacted?): Custodian contacted. Attitude of owner is very favorable toward preservation.
18. Uses of natural area: Privately used for hunting; game management.
19. Uses of surrounding land: Wildland 70%; High-intensity forestry 30%
20. Preservation Status: Category 4, 100%

TABLE 6. Significance summary of Jones Creek Savanna Natural Area.

Feature	Map Legend	Description of feature	Comparative asse-sment
Endangered or threatened sp.	1a	Venus' fly-trap	Small population in wettest part of savanna
Endangered or threatened sp.	1b	Red-cockaded Woodpecker	Population in good condition, natural area managed for timber and game; good habitat available
Endangered or threatened sp.	1c	Bachman's Sparrow	Twelve males and several family groups seen
Special management area	2	Pine savanna on rotational burn program; game food plot development	Part of 9,000 ac preserve; diverse habitats and spp.

21. Regulatory protections in force: None other than those provided by landowner.
22. Threats: None
23. Management and Preservation Recommendations: None needed as presently managed. Landowner may be receptive to registration of site.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary:

Community type: Pinus palustris/Aristida stricta savanna

Community cover type: Pinus palustris

General habitat feature: Longleaf pine savanna

Average canopy height: 60 ft

Estimated age of canopy trees: 60-80 years as determined by increment borings

Canopy cover: Open

Estimated size of community: Approximately 300 ac, but in discontinuous tracts, interrupted by small drainages, and areas of pocosin.

Successional stage: Fire-maintained climax

Sere type: Psammosere

Common canopy species in community cover or community type (but not dominant): Pinus serotina

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Stump sprouts of Liquidambar styraciflua, Magnolia virginiana, Persea borbonia, and Ilex glabra

Common herb stratum species in community cover or community type (but not dominant): Xyris platylepis, Lobelia nuttallii, Liatris graminifolia, Scleria sp., Sarracenia flava, Drosera capillaris, Lycopodium alopecuroides, Polygala cruciata

24B. Soil Summary (by community type)

Soil series: Lumbee, Johns, and Kalmia

Soil classification: Alfisols

Soil association: Lumbee-Johns-Kalmia

pH class: 5.0 to 6.0; very strongly acid to medium acid

Moisture class: Well drained to poorly drained

Source of information: General Soil Map, Pender County, USDA, SCS (1972) and site testing with Lamotte test kit

24C. Hydrology Summary (by community type)

Hydrologic system: Terrestrial

Hydrologic subsystem: Wet to mesic

Water chemistry: Fresh

Water regime: Not applicable

Drainage class: Somewhat poorly drained

Drainage basin: Black River tributary of Cape Fear River

Hydrology characterization: Somewhat poorly drained elevated terrace of Black River system, nearly level to very gently sloping into the lesser drainage of Jones Creek.

- 24D. Topography Summary
Landform: Terrace flat
Shelter: Partly sheltered
Aspect: If applicable, west
Slope angle: Very gently sloping (0-2°) to flat
Profile: Flat
Surface patterns: Smooth
Position: Not applicable
25. Physiographic characterization of natural area: A fire-maintained climax community of a poorly drained psammose on an upland terrace of Jones Creek, a tributary of Black River, and underlain by Cretaceous Pee Dee formation of impure limestones and sands and sandy clays of the Coastal Plain province of the Atlantic Plain.
Geological Formation: Cretaceous Pee Dee formation overlain by Quaternary sands.
Geological Formation age: Cretaceous formation: 60 million years;
Quaternary sands: 6,000 to 1 million years.
26. Summary - Endangered and threatened species:
(1) Name of species: Dionaea muscipula (DIONAEACEAE) Venus' fly-trap
Species legal status and authority: NC threatened endemic, exploited (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: 40
Size or maturity of individuals: Seedlings, mature plants
Phenology of population: Vegetative: 100%; site not visited during flowering or fruiting times.
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:
Plant community: Longleaf pine savanna
Topography: Level
Soil series: Lumbee, Johns, or Kalmia
Microclimate: Not determined
Drainage basin: Cape Fear River
Other plants and animal species present: Plants: Sarracenia flava, Drosera sp., Eriocaulon decangulare, Xyris sp.; Animals: see attached master species lists.
(2) Name of species: Red-cockaded Woodpecker
Species legal status and authority: Federally endangered (Cooper et al. 1977)
Number of populations on site: Not determined
Number of individuals per population: 5 active cavities, 7 inactive cavities, 2 active starts, and 3 inactive starts
Size or maturity of individuals: Adult
Phenology of population: Not applicable
General vigor of population: Apparently healthy and reproducing
Disturbance or threats to population: None
Habitat characteristics:

Plant community: Longleaf pine savanna
Topography: Level
Soil series: Lumbee, Johns, or Kalmia
Microclimate: Not determined
Drainage basin: Cape Fear River
Other plant and animal species present: See attached master species lists.

(3) Name of species: Bachman's Sparrow
Species Legal status and authority: NC threatened (Cooper et al. 1977)
Number of populations on site: 1
Number of individuals per population: Twelve singing males and several family groups
Size or maturity of individuals: Immature and mature
Phenology of population: Not applicable
General vigor of population: Vigorous
Disturbance or threats to population: None
Habitat characteristics:

Plant community: Longleaf pine savanna
Topography: Level
Soil series: Lumbee, Johns, or Kalmia
Microclimate: Not determined
Drainage basin: Cape Fear River
Other plants and animals present: See attached master species lists.

(See FIGURE 16. for detailed map of endangered and threatened species locations.)

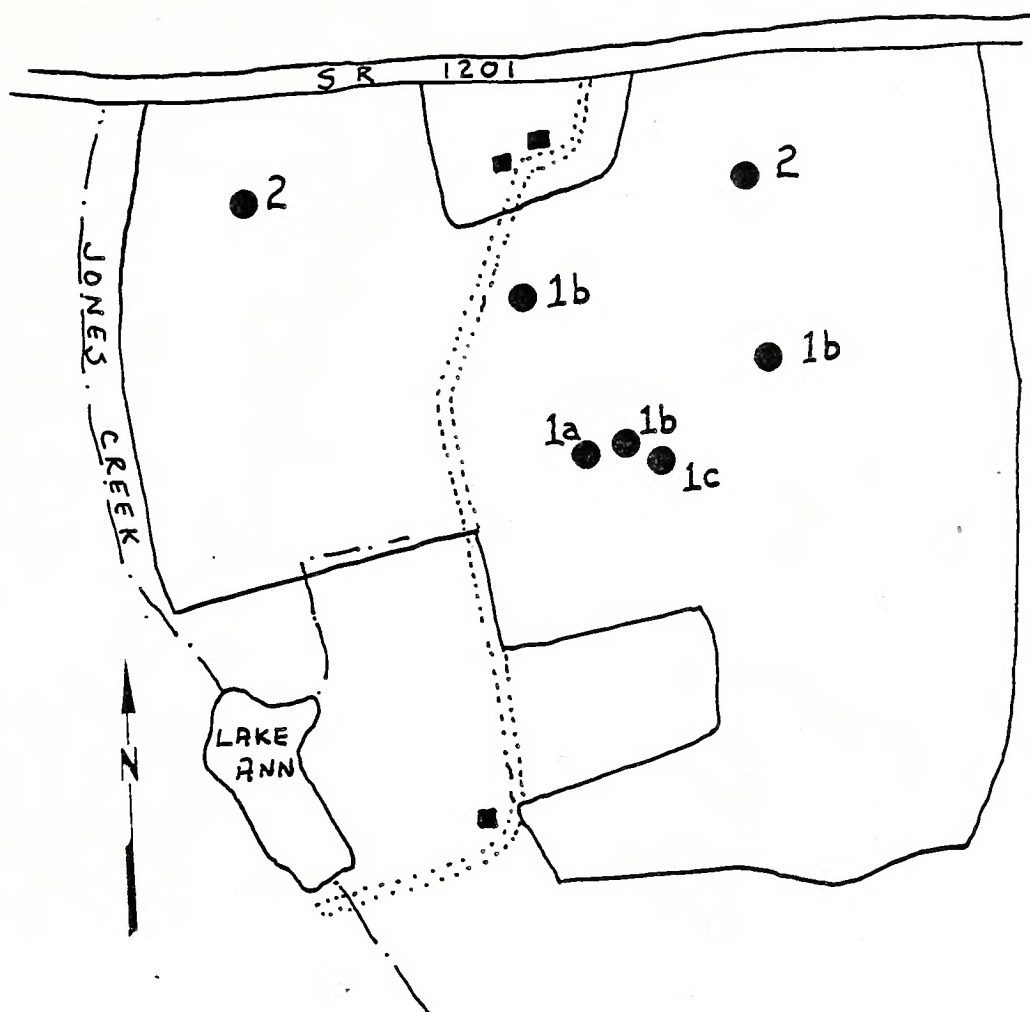


FIGURE 16. Significant features of Jones Creek Savanna Natural Area. Code: (1) Endangered or threatened species, (2) Special management area. Map scale: 1 in. = 1200 ft.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE

Acer rubrum

AMARYLLIDACEAE

Hypoxis hirsuta

H. micrantha

ANACARDIACEAE

Rhus radicans

APIACEAE

Eryngium yuccifolium

Hydrocotyle umbellata

Oxypolis ternata

AQUIFOLIACEAE

Ilex glabra

ASCLEPIADACEAE

Asclepias humistrata

A. lanceolata

ASTERACEAE

Aster linariifolius

A. spectabilis

A. squarrosus

A. tortifolius

Carduus lecontei

Carphephorus tomentosus

Chaptalia tomentosa

Chrysopsis gossypina

C. graminifolia

Coreopsis angustifolia

Elephantopus nudatus

Eupatorium album

E. leucolepis

E. rotundifolium

Helianthus heterophyllus

Liatris graminifolia

Marshallia graminifolia

Solidago stricta

Trilisa odoratissima

BLECHNACEAE

Woodwardia virginica

BROMELIACEAE

Tillandsia usneoides

CAMPANULACEAE

Lobelia nuttallii

CLETHRACEAE

Clethra alnifolia

CYPERACEAE

Dichromena latifolia

Fuirena squarrosa
 Rhynchospora cephalantha
 Scleria pauciflora
 CYRILLACEAE
 Cyrilla racemiflora
 DIONAEACEAE
 Dionaea muscipula
 DROSERACEAE
 Drosera capillaris
 D. leucantha
 ERICACEAE
 Gaylussacia dumosa
 Lyonia ligustrina
 Vaccinium crassifolium
 ERIOCAULACEAE
 Eriocaulon decangulare
 FABACEAE
 Amorpha herbacea
 Baptisia cinerea
 B. tinctoria
 Cassia nictitans
 Lespedeza virginica
 Tephrosia spicata
 FAGACEAE
 Quercus marilandica
 GENTIANACEAE
 Sabatia campanulata
 S. stellaris
 HAEMODORACEAE
 Lachnathes caroliniana
 HAMAMELIDACEAE
 Liquidambar styraciflua
 HYPERICACEAE
 Hypericum stans
 IRIDACEAE
 Sisyrinchium mucronatum var. atlanticum
 LAMIACEAE
 Pycnanthemum flexuosum
 LAURACEAE
 Persea borbonia
 LENTIBULARIACEAE
 Pinguicula caerulea
 P. lutea
 Utricularia subulata
 LILIACEAE
 Aletris farinosa
 Lilium catesbaei
 Melanthium virginicum
 Smilax bona-nox
 S. laurifolia
 Tofieldia racemosa
 Zigadenus glaberrimus

LOGANIACEAE
 Gelsemium sempervirens
 Mitreola petiolata
LORANTHACEAE
 Phoradendron serotinum
LYCOPODIACEAE
 Lycopodium alopecuroides
 L. appressum
 L. carolinianum
MAGNOLIACEAE
 Magnolia virginiana
MELASTOMATACEAE
 Rhexia alifanus
 R. lutea
 R. mariana
 R. petiolata
MYRICACEAE
 Myrica cerifera
NYSSACEAE
 Nyssa biflora
ONAGRACEAE
 Ludwigia hirtella
ORCHIDACEAE
 Calopogon pulchellus
 Habenaria blephariglottis
 H. ciliaris
 H. cristata
 Pogonia ophioglossoides
OSMUNDACEAE
 Osmonda cinnamomea
 O. regalis var. *spectabilis*
PINACEAE
 Pinus palustris
 P. serotina
 P. taeda
POACEAE
 Andropogon scoparius
 Arundinaria gigantea
 Ctenium aromaticum
 Panicum aciculare
 Uniola laxa
POLYGALACEAE
 Polygala brevifolia
 P. cruciata
 P. lutea
PTERIDACEAE
 Pteridium aquilinum
SARRACENIACEAE
 Sarracenia flava
 S. purpurea

SCROPHULARIACEAE

Agalinis purpurea
Seymeria cassioides

SOLANACEAE

Physalis angulata

SYMPLOCACEAE

Symplocos tinctoria

TAXODIACEAE

Taxodium distichum

VIOLACEAE

Viola lanceolata

XYRIDACEAE

Xyris ambigua
X. baldwiniana
X. platylepis

AMPHIBIANS

Southern Toad
Southern Cricket Frog

REPTILES

Eastern Mud Turtle
Eastern Box Turtle
Eastern Glass Lizard
Green Anole
Six-lined Racerunner
Ground Skink
Black Racer
Canebrake Rattlesnake .

BIRDS

KEY

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Turkey Vulture	PV
Red-tailed Hawk	PV
Bobwhite	PR*
Turkey	PR* (?)
Mourning Dove	PR*
Common Flicker	PR*
Pileated Woodpecker	PR*

Red-bellied Woodpecker	PR*
Downy Woodpecker	PR*
Red-cockaded Woodpecker	PR*
Eastern Kingbird	SR*
Crested Flycatcher	SR*
Eastern Wood Pewee	SR*
Blue Jay	PR*
Common Crow	PR*
Carolina Chickadee	PR*
Tufted Titmouse	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
Brown Thrasher	PR*
Eastern Bluebird	PR*
Blue-gray Gnatcatcher	SR*
Starling	PR*
White-eyed Vireo	SR*
Red-eyed Vireo	SV
Northern Parula Warbler	SV
Yellow-throated Warbler	SV
Pine Warbler	PR*
Prairie Warbler	SR*
Common Yellowthroat	PR*
Yellow-breasted Chat	SR*
Eastern Meadowlark	PR*
Orchard Oriole	SR*
Common Grackle	PR*
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Cardinal	PR*
Indigo Bunting	SR*
Blue Grosbeak	SR*
Rufous-sided Towhee	PR*
Field Sparrow	PR*
Bachman's Sparrow	PR*

MAMMALS

Raccoon
 Eastern Mole
 Eastern Gray Squirrel
 Eastern Cottontail
 Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: 421 Sand Ridge
2. County: Pender
3. Location: On both sides of US 421, from the Pender-New Hanover County line, northwest for approximately 3 miles. The natural area is bounded of the east by the swamp of the Northeast Cape Fear River and on the west by the swamp of Black River, included in the Black River Natural Area. Coordinates: 34°22'N, 78°01'W (FIGURE 17).
4. Topographic Quadrangle: Acme, NC 1954 (15' series)
5. Size: 3,080 ac
6. Elevation: 10 ft to 40 ft above mean sea level
7. Access: Pedestrian access from US 421; infrequent hunter trails usually gated and locked.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May 6 and August 28, 1981
10. Priority rating: High
- 11A. Prose Description of Site: The 421 Sand Ridge Natural Area occupies a peninsula between the Northeast Cape Fear and the Cape Fear Rivers. The geologic processes which were responsible for this landform include marine, riverine, and eolian factors. Sand was initially deposited during Pleistocene high sea level periods, uplifted, became increasingly well drained as the river valleys deepened, and during previous periods of vegetation cover absence, was sculptured by wind erosion and deposition. This landform is unique in North Carolina, partly because few other narrow peninsulas between major river systems have the contrast in elevation and particle size magnitude that is found on the 421 ridge. (A similar peninsula is present in South Carolina at the confluence of the Pee Dee and Little Pee Dee Rivers.) Subsurface sand is yellow and deep; surface material is highly leached, and appears white, or grayish when mixed with organics. The topography is seldom level, and the surface is marked by eolian depressions, solution slumps, Carolina bay ellipses, and sluggish, meandering streams.

From the crest of the ridge to the river swamps, the cover vegetation changes from longleaf pine - turkey oak to longleaf pine - gallberry and eventually to pond pine pocosin. Wet depressions are usually filled

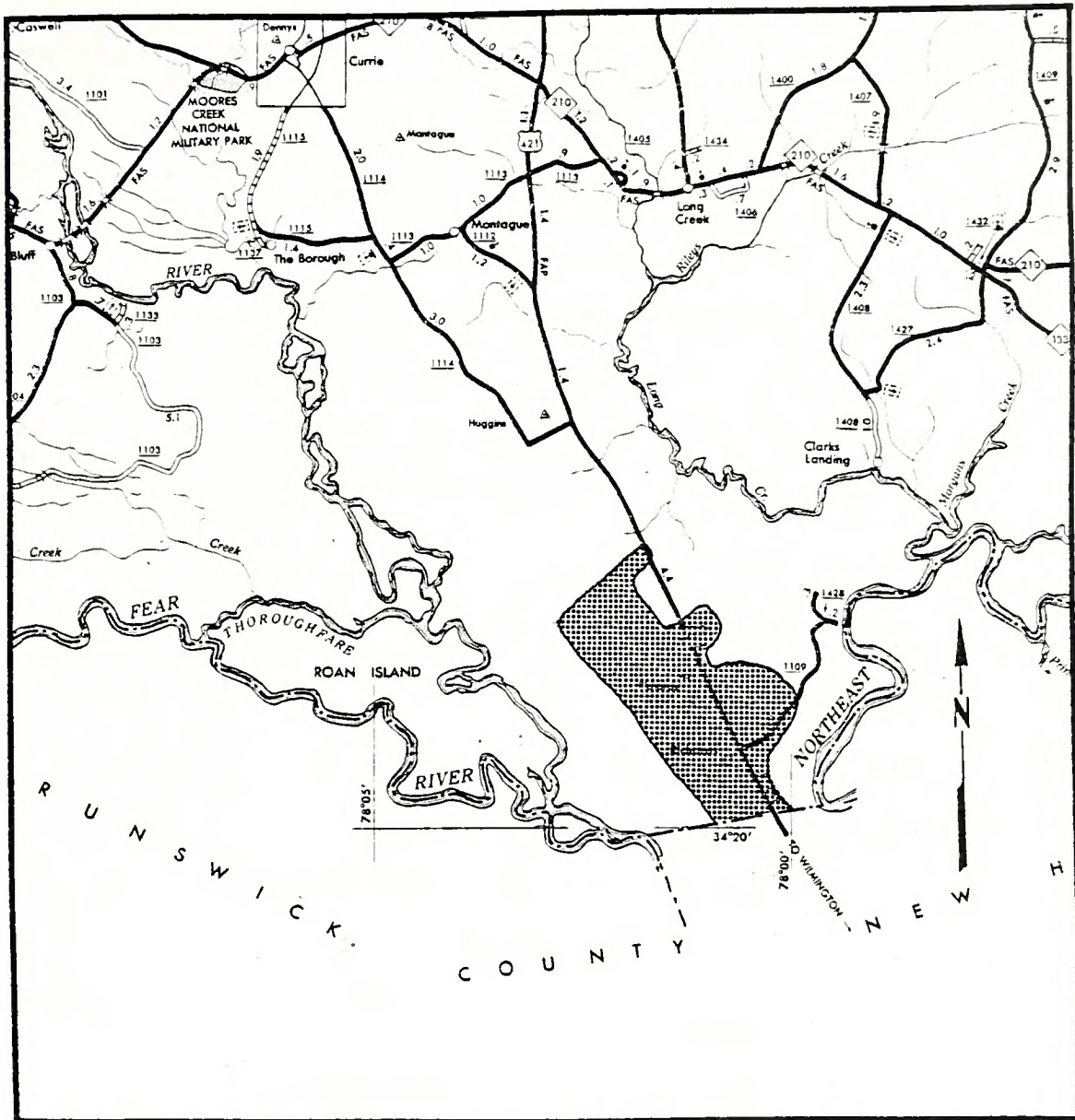


FIGURE 17. 421 Sand Ridge Natural Area. Map scale: 1 in. = 2 mi.

by thickets of evergreen shrubs and catbrier or occasionally by pond cypress. Forests on the ridge do not contain unusual-size trees, unique assemblages of species, or high volume boardfootage. The natural area includes, however, colonies of the federally-protected Red-cockaded Woodpecker, and the size class and condition of the longleaf pine forests indicates that a larger population of birds could be sustained, under proper management conditions. Altogether the 421 Sand Ridge Natural Area contains the largest area of longleaf pine - turkey oak forest that we found in Pender County.

- 11B. Prose Description of Site Significance: The so-called "Brunswick Escarpment" extends from Brunswick County, near Orton Plantation, across northwestern New Hanover County, and terminates in southern Pender County-- as the 421 sand ridge. While escarpments such as this are not unknown elsewhere, the occurrence in North Carolina of a sizeable sand body, excluding the fall-line sandhills, is relatively unique. A second factor of significance in this natural area is the occurrence of several colonies of Red-cockaded Woodpeckers.

Prehistoric and historic significance was not investigated during this study, but prior to 1980, several archaeological forays in the area produced noteworthy collections of artifacts. Aboriginal implements have been found in the area which indicate occupancy around 5,000 years before present. Further investigations along these lines should be conducted.

12. Significance Summary (See TABLE 7)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%
14. Number of Owners: Generally, 2
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information):
(1) Bruce B. Cameron, 2219 Blythe Rd., Wilmington, NC (763-1054)
(2) Corbett Package Co., and Corbett Industries, Wrightsboro (Wilmington), NC (763-4646)
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Jay Carter, Southern Pines, is familiar with locations of Red-cockaded Woodpeckers in natural area.
17. Attitude of owner or custodian toward preservation (contacted?): Owners not contacted, but reportedly favor industrial development of tract.
18. Uses of natural area: Hunting
19. Uses of surrounding land: Wildland 100%

TABLE 7. Significance summary of 421 Sand Ridge Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
Endangered or threatened sp.	1a	Beyrich's bog button	Stable population with intermediates; infrequent
Endangered or threatened sp.	1b	Red-cockaded Woodpecker	Several small colonies; fairly good habitat
Outstanding geomorphologic feature	2	Brunswick escarpment	Present in three-county area only

20. Preservation Status: Category 7, 100%
21. Regulatory protections in force: Unknown
22. Threats: No major threats are evident.
23. Management and Preservation Recommendation: Because both of the principal landowners are among the largest landholders in Pender County, there may be opportunity to preserve all or significant pieces of this natural area. Based on land use trends in New Hanover County and the apparent planning and zoning strategy in Brunswick to encourage industrial development, the Pender County portion of the Brunswick Escarpment may, in the future, be all that remains in a natural condition. Therefore, it is recommended that second phase investigation (precise boundary delineation, discussion with landowners, etc.) be conducted. Fire is a significant component of ecology of this natural area, and piecemeal industrial and/or residential development may require increased fire protection of both developed and undeveloped woodlands. Should this be the case, management and preservation would be difficult to implement.

Natural Characteristics Summary

- 24A. Vegetation - Biotic Community Summary:
Community type: Pinus palustris-Quercus laevis/Aristida stricta forest
Community cover type: Pinus palustris
General habitat feature: Longleaf pine sand ridge
Average canopy height: 35 ft
Estimated age of canopy trees: 40-70 years
Canopy cover: Varies from closed to open
Estimated size of community: Probably more than 10,000 ac, but in the circumscribed natural area, possibly 75 percent of the 3,080 ac.
Successional stage: Edaphic climax
Sere type: Psammosere
Common canopy species in community cover or community type (but not dominant): None
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Quercus margaretta, Quercus incana
Common herb stratum species in community cover or community type (but not dominant): Cnidoscolus stimulosus, Chrysopsis gossypina, Stipulicida setacea, Agalinis setacea, Selaginella arenicola spp. acanthonota
- 24B. Soil Summary (by community type)
Soil series: Kureb, Rimini, Lakeland, Leon, and Wakulla sands
Soil classification: Not determined
Soil association: Lynn Haven-Leon-Kureb
pH class: Very strongly acid
Moisture class: Excessively drained
Source of information: General Soil Map, Pender County, USDA, SCS, (1972).
- 24C. Hydrology Summary (by community type)
Hydrologic system: Terrestrial

Hydrologic subsystem: Very dry-xeric
Water chemistry: Fresh
Water regime: Not applicable
Drainage class: Excessively drained
Drainage basin: Northeast Cape Fear and Cape Fear Rivers
Hydrology characterization: Excessively drained sand ridge occupying the peninsula between the Northeast Cape Fear and the Cape Fear River Basins.

24D. Topography Summary

Landform: Escarpment sand ridge
Shelter: Open to partly sheltered
Aspect: Northeast - southwest
Slope Angle: Gently sloping to sloping
Profile: Constant, with slight variations of microrelief
Surface patterns: Irregular
Position: Upper and mid-slope

25. Physiographic characterization of natural area: An edaphic climax community of a psammosere on an escarpment sand ridge, scalloped laterally by meanders of the Northeast Cape Fear and Cape Fear Rivers, and vertically by wind erosion, Carolina bay formation, and/or solution slumping. The ridge drains into both river basins, is underlain by Eocene Castle Hayne limestone, and is comprised of deep sands of Pleistocene and Holocene origin, deposited in the Coastal Plain province of the Atlantic Plain.
- Geological Formation: Eocene Castle Hayne limestone; Pleistocene and Holocene sands
- Geological Formation age: Eocene formation: 40-50 million years;
Pleistocene deposits: 6,000 to ca. 3 million years before present;
Holocene: slightly less than 6,000 years before present

26. Summary - Endangered and threatened species:

(1) Name of species: Red-cockaded Woodpecker

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations on site: Not determined

Number of individuals per population: Five trees with active cavities, inactive cavities or starts were seen; also one bird.

Size or maturity of individuals: Presumed to be a breeding population

Phenology of population: Not applicable

General vigor of population: Not determined

Disturbance or threats to population: None visible

Habitat characteristics:

Plant community: Longleaf pine - turkey oak sand ridge

Topography: Gently sloping to sloping

Soil series: Kureb sand

Microclimate: Not determined

Drainage basin: Northeast Cape Fear River, Cape Fear River

Other plants and animal species present: Plants: Polygonella polygama, Froelichia sp., Vaccinium sp.; Animals: see attached master species lists.

(See FIGURE 18 for detailed map of endangered and threatened species locations.)

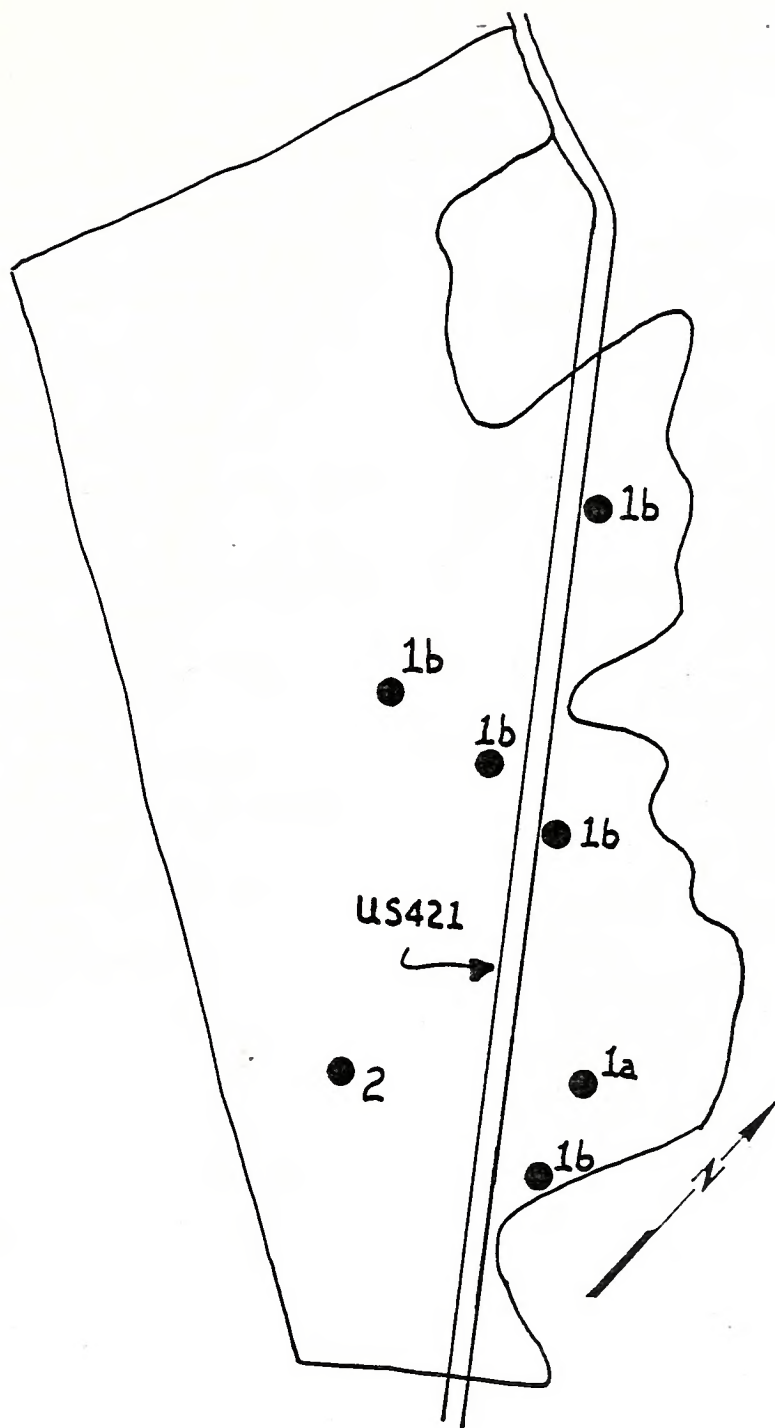


FIGURE 18. Significant features of 421 Sand Ridge Natural Area. Code: (1) Endangered or threatened species, (2) Outstanding geomorphologic feature. Map scale: 1 in. = 1.4 mi. (highway not drawn to scale).

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACERACEAE

Acer rubrum

AMARANTHACEAE

Froelichia floridana

AMARYLLIDACEAE

Hypoxis hirsuta

H. micrantha

ANACARDIACEAE

Rhus copallina

R. radicans

R. toxicodendron

ANNONACEAE

Asimina parviflora

APIACEAE

Centella asiatica

AQUIFOLIACEAE

Ilex cassine

I. cassine var. *myrtifolia*

I. coriacea

I. glabra

I. opaca

ASPLENIACEAE

Asplenium platyneuron

ASTERACEAE

Ambrosia artemesiifolia

Carduus lecontei

C. spinosissimus

Chondrophora nudata

Chrysopsis gossypina

C. graminifolia

Conyza canadensis

Coreopsis angustifolia

Erigeron quercifolius

Eupatorium capillifolium

E. recurvans

Haplopappus divaricatus

Helenium amarum

Krigia virginica

Liatris graminifolia

Marshallia graminifolia

Mikania scandens

Silphium compositum

Trilisa paniculata

BLECHNACEAE

Woodwardia areolata

W. virginica

BROMELIACEAE
 Tillandsia usneoides
 CACTACEAE
 Opuntia compressa
 CAPRIFOLIACEAE
 Lonicera sempervirens
 CARYOPHYLLACEAE
 Arenaria caroliniana
 Stipulicida setacea
 CISTACEAE
 Lechea villosa
 CLETHRACEAE
 Clethra alnifolia
 COMMELINACEAE
 Tradescantia rosea var. *graminea*
 CONVOLVULACEAE
 Bonamia patens var. *patens*
 B. patens var. *angustifolia*
 Ipomoea pandurata
 CYPERACEAE
 Bulbostylis capillaris
 B. ciliatifolia
 Carex grayi
 Dichromena latifolia
 Rhynchospora chalarocephala
 R. corniculata
 DIAPENSIACEAE
 Pyxidanthera barbulata
 DROSERACEAE
 Drosera capillaris
 EBENACEAE
 Diospyros virginiana
 ERICACEAE
 Gaylussacia dumosa
 G. frondosa
 Lyonia lucida
 Rhododendron atlanticum
 Vaccinium arboreum
 V. crassifolium
 V. elliotii
 V. stamineum
 V. tenellum
 ERIOCAULACEAE
 Lachnocaulon anceps
 L. beyrichianum
 EUPHORBIACEAE
 Cnidoscolus stimulosus
 Euphorbia ipecacuanhae
 FABACEAE
 Amorpha herbacea

Baptisia tinctoria
 Crotalaria purshii
 Galactia regularis
 Lupinus perennis
 L. villosus
 Rhynchosia difformis
 Tephrosia spicata
 FAGACEAE
 Castanea pumila
 Quercus incana
 Q. laevis
 Q. margaretta
 Q. pumila
 Q. virginiana
 HYPERICACEAE
 Hypericum reductum
 LAURACEAE
 Persea borbonia
 Sassafras albidum
 LILIACEAE
 Smilax bona-nox
 S. laurifolia
 LOGANIACEAE
 Gelsemium sempervirens
 LYCOPODIACEAE
 Lycopodium alopecuroides
 L. carolinianum
 MELASTOMACEAE
 Rhexia mariana
 MYRICACEAE
 Myrica cerifera
 NYSSACEAE
 Nyssa biflora
 OLEACEAE
 Osmanthus americanus
 OSMUNDACEAE
 Osmunda cinnamomea
 O. regalis var. spectabilis
 PINACEAE
 Pinus palustris
 P. serotina
 P. taeda
 POACEAE
 Andropogon scoparius
 A. virginicus
 Arundinaria gigantea
 Panicum ciliatum
 P. lancearium
 POLYGALACEAE
 Polygala cymosa

POLYGONACEAE

Polygonella polygama

PTERIDACEAE

Pteridium aquilinum

RUBIACEAE

Richardia scabra

SCROPHULARIACEAE

Agalinis purpurea

A. setacea

Seymeria cassioides

SELAGINELLACEAE

Selaginella arenicola spp. acanthonota

TAXODIACEAE

Taxodium distichum

VERBENACEAE

Callicarpa americana

VITACEAE

Vitis rotundifolia

AMPHIBIANS

Southern Toad

Oak Toad

Southern Cricket Frog

Squirrel Tree Frog

REPTILES

Eastern Glass Lizard

Green Anole

Six-lined Racerunner

Ground Skink

Black Racer

BIRDS

Key

PR = Permanent resident

SR = Summer resident

WR = Winter resident

T = Transient, spring or fall

PV, SV, WV = Visitor; permanent, summer, or winter

* = Breeding or suspected breeding at site

Turkey Vulture

PV

Red-tailed Hawk

PV

American Kestrel

WR

Bobwhite

PR*

Mourning Dove	PR*
Common Nighthawk	SR*
Common Flicker	PR*
Red-cockaded Woodpecker	PR*
Eastern Kingbird	SR*
Crested Flycatcher	SR*
Blue Jay	PR*
Common Crow	PR*
Fish Crow	PV
Carolina Chickadee	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
American Robin	WR
Eastern Bluebird	PR*
Blue-gray Gnatcatcher	SR*
Starling	PR*
Pine Warbler	PR*
Prairie Warbler	SR*
Eastern Meadowlark	PV
Red-winged Blackbird	PV
Common Grackle	PR*
Summer Tanager	SR*
Cardinal	PR*
Blue Grosbeak	SR*
Rufous-sided Towhee	PR*
Field Sparrow	WR

MAMMALS

Eastern Mole
 Eastern Fox Squirrel
 Eastern Cottontail
 Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Moores Creek Wildlife Reservation
2. County: Pender
3. Location: The natural area stretches from NC 53 along both sides of Moores Creek, downstream to a point about a mile south of Moores Creek National Military Park, and includes the bottomlands of Mill Branch upstream to SR 1128 and an area of flatwoods along SR 1100. Coordinates: 34°30'N, 78°08'W (FIGURE 19).
4. Topographic Quadrangle(s): Acme, NC 1954; Atkinson, NC 1955 (15' series)
5. Size: 4,500 ac
6. Elevation: 8 ft to 60 ft above mean sea level
7. Access: Natural area can be reached by travelling west from US 421 on NC 210, following the signs to Moores Creek National Military Park, or by following NC 53 west toward Atkinson. An excellent access route is to follow SR 1125 between Yamacraw and Rooks. Limited access is possible via the abandoned Atlantic Coast Line Railroad right-of-way northwest of Currie.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May-September 1981
10. Priority Rating: High
- 11A. Prose Description of Site: Moores Creek Wildlife Reservation (and registered black bear sanctuary) is a consolidated tract of land that formerly consisted of several parcels belonging to various members of the Simpson family, and now held under a single ownership. The land is situated on both sides of Moores Creek and is largely wooded, the major vegetation type of the lowlands being seasonally flooded cypress and mixed hardwoods, whereas the uplands are comprised of loblolly pine woods, old fields, or cultivated lands.

Brief community surveys were made where the major roads cross the floodplain of Moores Creek; interior sections of the tract were not inventoried. There is no reason to indicate that community composition differs greatly from the southern extremity of the tract to the northern limits. Because the tract connects with the extreme lower portion of Moores Creek, and hence with the Black River corridor, the contiguity of forest provides sanctuary and lengthy habitat for wide-ranging fauna.

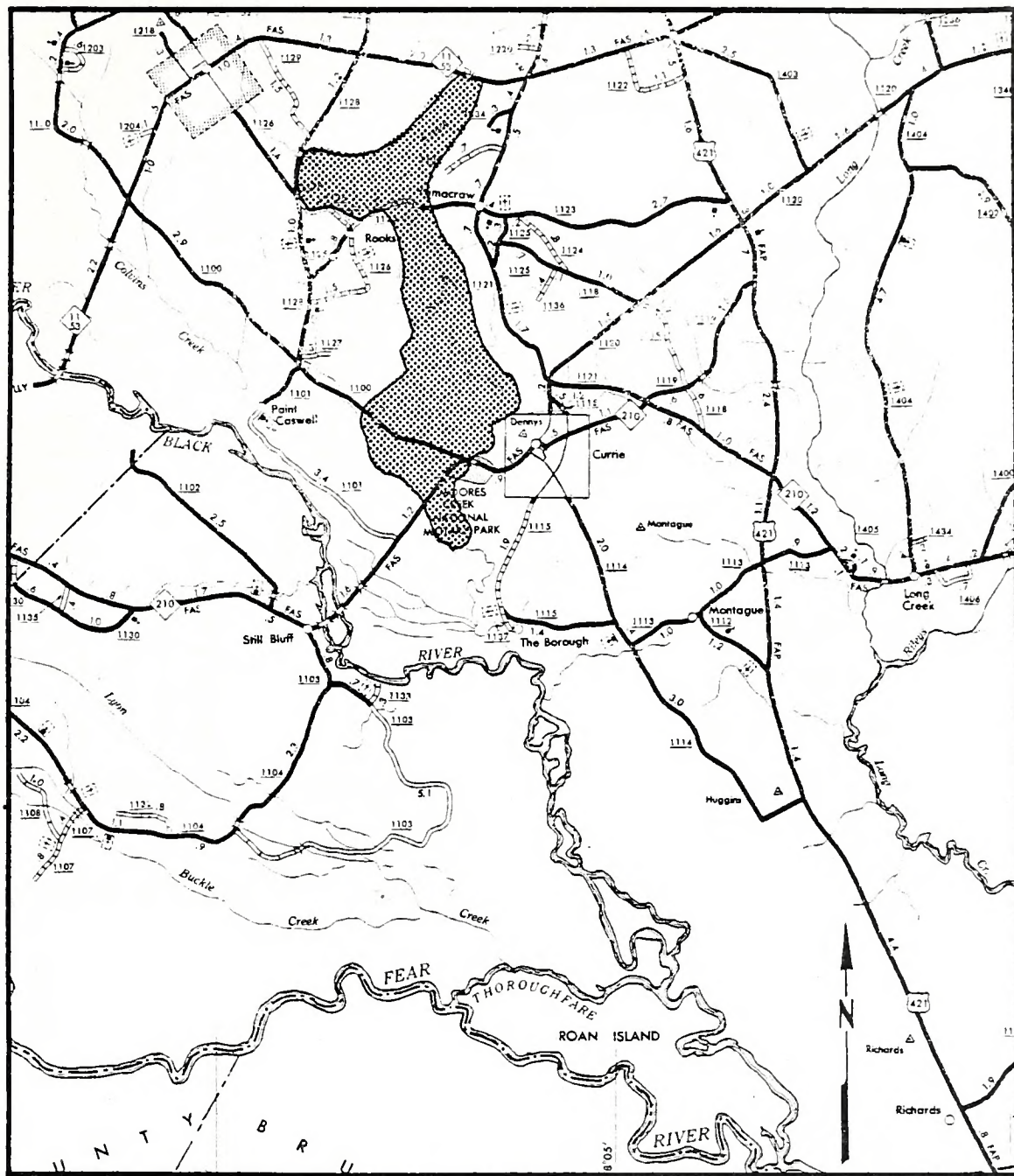


FIGURE 19. Moores Creek Wildlife Reservation Natural Area. Map scale: 1 in. = 2 mi.

No unique communities, assemblages of species, endangered or threatened plant species were found in the Moores Creek Wildlife Reservation. In addition, landforms and underlying rock types and soil associations are not significantly different from other inner coastal plain streams. Consequently the site was included as a significant natural area in Pender County for other than botanical reasons.

- 11B. Prose Description of Site Significance: The features of Moores Creek Wildlife Reservation which make it a significant site are (1) the owner's attitude toward preservation and management, (2) the fact that the tract is relatively large and not divided into small landholdings, (3) the assemblages of communities are representative of large coastal plain stream floodplains and slopes, (4) the already existing registration of the area as a game sanctuary, and (5) the presence of at least one thriving colony of the federally endangered Red-cockaded Woodpecker. Additionally, and with possible future implications for park status, is the location of the tract adjacent to the Moores Creek National Military Park.

12. Significance Summary (See TABLE 8)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%
14. Number of Owners: 1
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Dr. C. F. Simpson; Route 1, Box 273-A; Atkinson, NC 28421
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): None known
17. Attitude of owner or custodian toward preservation (contacted?): Owner was very cordial when contacted and provided a considerable volume of background information pertaining to the Simpson family, their activities in the community, and historical details of the plantation and family home. The owner's attitude toward preservation was assessed as excellent.
18. Uses of natural area: Marginal areas of agriculture, timber management, but largely game management for very limited large and small game hunting.
19. Uses of surrounding land: Wildland 30%; Agricultural land 40%; High-intensity forestry 15%; Developed 10% Undeveloped park land 5%
20. Preservation Status: Category 4, 100% (This area may be Category 5 land, depending upon criteria of which we were unaware.)

TABLE 8. Significance summary of Moores Creek Wildlife Reservation Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
Endangered or threatened sp.	1	Red-cockaded Woodpecker	Active colony in declining habitat; 11 cavity (active and inact.) trees
Special management area	2	Black bear sanctuary	Large corridor connecting with Black River/Cape Fear River swamps
High faunistic diversity	3	Passerine bird habitat	Bottomland swamps and nearby pine woods offer secluded space for birds

21. Regulatory protections in force: Large portions of the property are regulated wetlands, being contiguous to navigable waters.
22. Threats: No major threats to the area.
23. Management and Preservation Recommendation: None beyond those procedures already implemented by owner.

Natural Characteristics Summary

24A. Vegetation - Biotic Community Summary

Community type: CT-1: Taxodium distichum-Mixed hardwoods

Community cover type: Taxodium distichum

General habitat feature: Bottomland swamp

Average canopy height: 50-60 ft

Estimated age of canopy trees: 50 years

Canopy cover: Closed

Estimated size of community: 2,500 ac

Successional stage: Late transient

Sere type: Hydrosere

Common canopy species in community cover or community type (but not dominant): Betula nigra, Liquidambar styraciflua, Pinus taeda, Quercus michauxii

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Alnus serrulata, Itea virginica, Ilex opaca

Common herb stratum species in community cover or community type (but not dominant): Orontium aquaticum, Pluchea camphorata, Boehmeria cylindrica

Community type: CT-2 Pinus taeda/Ilex glabra

Community cover type: Pinus taeda

General habitat feature: Pine flatwoods

Average canopy height: 60 ft

Estimated age of canopy trees: 75 years

Canopy cover: Closed

Estimated size of community: 1,000 ac

Successional stage: Transient

Sere type: Psammosere

Common canopy species in community cover or community type (but not dominant): None

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Vaccinium atrococcum, Magnolia virginiana

Common herb stratum species in community cover or community type (but not dominant): Cnidioscolus stimulosus, Andropogon virginicus, Panicum sp.

24B. Soil Summary (CT-1)

Soil series: Lumbee

Soil classification: Not determined

Soil association: Lumbee-Johns-Kalmia

pH class: Very strongly acid to medium acid

Moisture class: Poorly drained

Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

Soil Summary (CT-2)

Soil series: Johns and Kalmia

Soil classification: Not determined

Soil association: Lumbee-Johns-Kalmia

pH class: Strongly acid to medium acid

Moisture class: Somewhat poorly drained to well drained

Source of information: General Soil Map, Pender County, USDA, SCS, (1972).

24C. Hydrology Summary (CT-1)

Hydrologic system: Riverine

Hydrologic subsystem: Lower perennial

Water chemistry: Fresh

Water regime: Intermittently flooded

Drainage class: Poorly drained

Drainage basin: Cape Fear River

Hydrology characterization: Poorly drained bottomlands adjacent to and including Moores Creek,

Hydrology Summary (CT-2)

Hydrologic system: Terrestrial

Hydrologic subsystem: Mesic to dry-mesic

Water chemistry: Fresh

Water regime: Not applicable

Drainage class: Somewhat poorly drained to moderately well drained

Drainage basin: Cape Fear River

Hydrology characterization: Somewhat poorly drained to moderately well drained sands occupying elevated terraces, sub-basin slopes, level inter-basin, slightly eroded plains.

24D. Topography Summary (CT-1)

Landform: Alluvial plain

Shelter: Deeply sheltered

Aspect: East-west

Slope angle: Less than 2%

Profile: Irregular to flat to slightly concave

Surface patterns: Slightly undulating to smooth

Position: Entire plain

Topography Summary (CT-2)

Landform: Interbasin flat

Shelter: Partly sheltered

Aspect: Not applicable

Slope angle: Mostly less than 2%

Profile: Flat

Surface patterns: Smooth

Position: Not applicable

25. Physiographic characterization of natural area: Moores Creek Natural Area is a biologically, edaphically, hydrologically, and topographically diverse area of two major habitat types, bottomlands and uplands, which are dominated by transients and which drain into the Cape Fear River Basin

of the Coastal Plain province of the Atlantic Plain.

Geological Formation: Cretaceous Pee Dee formation overlain by Pleistocene and Holocene sands

Geological Formation age: Cretaceous formation: 60 million years
Pleistocene and Holocene: 3 million years to present

26. Summary - Endangered and threatened species

(1) Name of species: Red-cockaded Woodpecker

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations of site: 1 observed

Number of individuals per population: Two birds (adults) seen; one nest containing chicks located; seven inactive cavities and starts in live trees; two inactive cavities in dead trees; and one active start.

Size or maturity of populations: Adult and immature

Phenology of population: Not applicable

General vigor of population: Evidence of reproduction

Disturbance or threats to population: None present, although understory is dense, and if not burned in a few years could jeopardize degree of site activity.

Habitat characteristics:

Plant community: Loblolly pine forest

Topography: Level

Soil series: Probably Kalmia, but not determined

Microclimate: Not determined

Drainage basin: Cape Fear River

Other plants and animal species present: Plants: Ilex glabra, Ilex opaca, Liquidambar styraciflua, Magnolia virginiana, Gaylussacia frondosa, Acer rubrum, Vaccinium spp.; Animals: see attached master species lists.

(See FIGURE 20 for detailed map of endangered species location.)

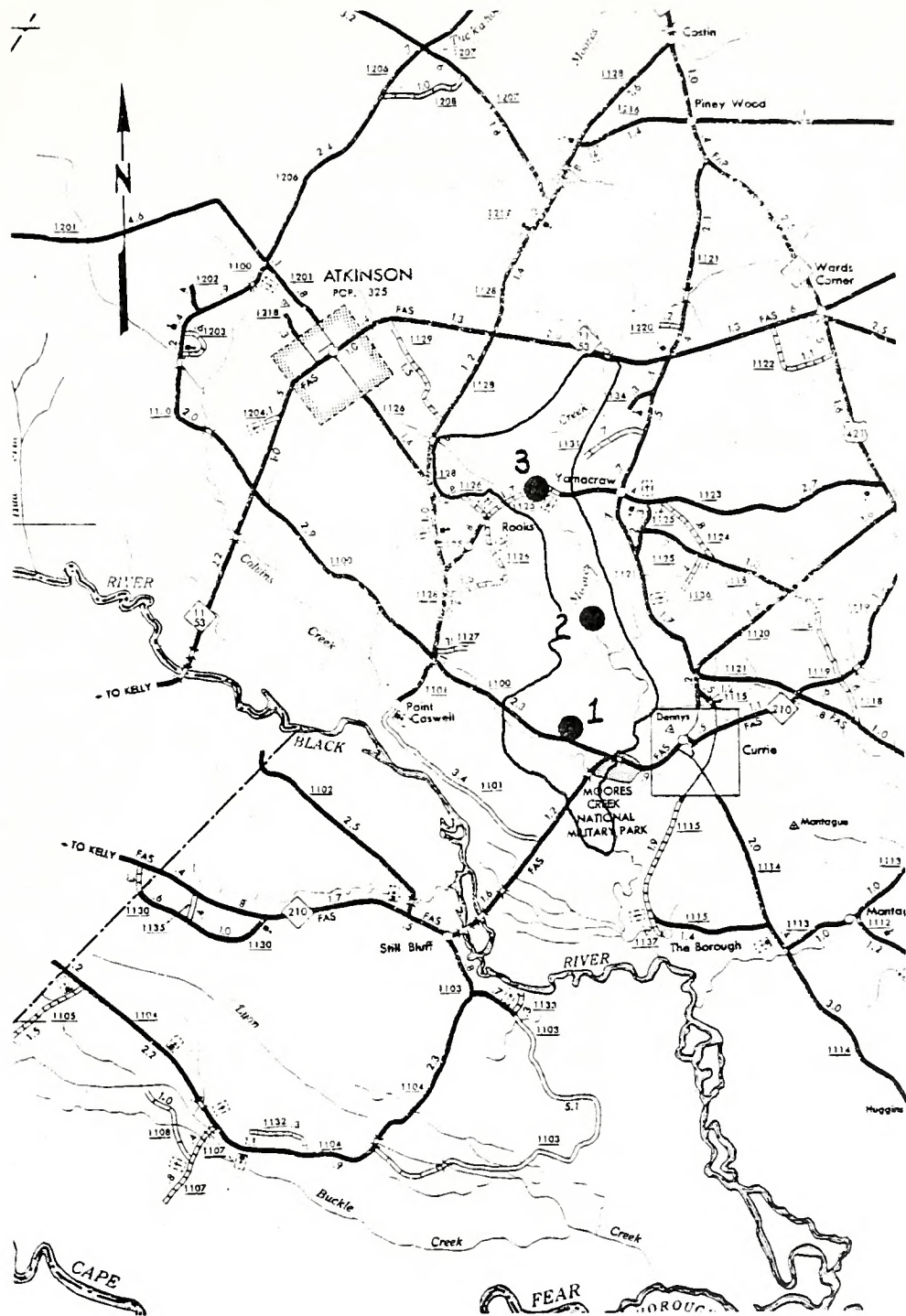


FIGURE 20. Significant features of Moores Creek Wildlife Reservation Natural Area. Code: (1) Endangered or threatened species, (2) Special management area, (3) High faunistic diversity. Map scale: 1 in = 2 mi.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE

Justicia ovata

ACERACEAE

Acer rubrum

ALISMACEAE

Sagittaria falcata

S. graminea

AMARANTHACEAE

Alternanthera philoxeroides

AMARYLLIDACEAE

Hymenocallis crassifolia

ANACARDIACEAE

Rhus radicans

R. vernix

APIACEAE

Centella asiatica

Cicuta maculata

Hydrocotyle umbellata

Ptilimnium capillaceum

AQUIFOLIACEAE

Ilex coriacea

I. glabra

I. opaca

I. verticillata

ARACEAE

Arisaema triphyllum

Orontium aquaticum

Peltandra virginica

ASPIDIACEAE

Athyrium asplenoides

Onoclea sensibilis

Thelypteris palustris

ASPLENIACEAE

Asplenium platyneuron

ASTERACEAE

Eupatorium fistulosum

Mikania scandens

Senecio glabellus

Vernonia noveboracensis

BETULACEAE

Alnus serrulata

Betula nigra

Carpinus caroliniana

BIGNONIACEAE

Anisostichus capreolata

Campsis radicans

BLECHNACEAE
 Woodwardia areolata
 W. virginica
 BROMELIACEAE
 Tillandsia usneoides
 CAMPANULACEAE
 Lobelia cardinalis
 CAPRIFOLIACEAE
 Lonicera japonica
 L. sempervirens
 Sambucus canadensis
 Viburnum nudum
 V. prunifolium
 CLETHRACEAE
 Clethra alnifolia
 CORNACEAE
 Cornus amomum
 C. florida
 C. stricta
 CYPERACEAE
 Carex albolutescens
 C. comosa
 C. crinita
 C. folliculata var. *australis*
 C. intumescens
 C. leptalea
 C. rosea
 C. tribuloides
 Cyperus iria
 C. strigosus
 Scirpus cyperinus
 CYRILLACEAE
 Cyrilla racemiflora
 ERICACEAE
 Chimaphila maculata
 Epigaea repens
 Gaylussacia frondosa
 Kalmia angustifolia var. *caroliniana*
 Leucothoe axillaris
 L. racemosa
 Lyonia ligustrina
 L. lucida
 L. mariana
 Rhododendron viscosum
 Vaccinium atrococcum
 V. corymbosum
 V. crassifolium
 V. elliotii
 V. stamineum
 EUPHORBIACEAE
 Acalypha rhomboidea

FABACEAE

Amorpha fruticosa
A. herbacea
Apios americana
Clitoria mariana
Indigofera caroliniana
Melilotus officinalis
Pueraria lobata
Trifolium campestre
Vicia angustifolia
Wisteria frutescens

FAGACEAE

Quercus laurifolia
Q. lyrata
Q. michauxii
Q. nigra

HAMAMELIDACEAE

Liquidambar styraciflua

JUGLANDACEAE

Carya aquatica

LAURACEAE

Persea borbonia

LILIACEAE

Smilax glauca
S. laurifolia
S. rotundifolia

LOGANIACEAE

Gelsemium sempervirens

LORANTHACEAE

Phoradendron serotinum

MAGNOLIACEAE

Liriodendron tulipifera
Magnolia virginiana

MYRICACEAE

Myrica cerifera
M. heterophylla

NYMPHAEACEAE

Nuphar luteum ssp. sagittifolium

NYSSACEAE

Nyssa aquatica
N. biflora
N. sylvatica

OLEACEAE

Chionanthus virginicus
Fraxinus caroliniana
F. pensylvanica
F. tomentosa
Ligustrum sinense
Osmanthus americana

ONAGRACEAE

Ludwigia palustris

OSMUNDACEAE
 Osmunda cinnamomea
 O. regalis var. *spectabilis*
 PINACEAE
 Pinus taeda
 PLATANACEAE
 Platanus occidentalis
 POACEAE
 Arundinaria gigantea
 Erianthus giganteus
 Glyceria striata
 Sacciolepis striata
 POLYGONACEAE
 Polygonum arifolium
 P. hydropiperoides
 P. punctatum
 P. sagittatum
 POLYPODIOIDES
 Polypodium polypodioides
 PRIMULACEAE
 Samolus parviflorus
 RHAMNACEAE
 Berchemia scandens
 ROSACEAE
 Rosa palustris
 RUBIACEAE
 Cephalanthus occidentalis
 Galium circaezans
 SALICACEAE
 Populus heterophyllus
 Salix nigra
 SAURURACEAE
 Saururus cernuus
 SAXIFRAGACEAE
 Decumaria barbara
 Itea virginica
 SCROPHULARIACEAE
 Gratiola virginiana
 Micranthemum umbrosum
 TAXODIACEAE
 Taxodium distichum
 TYPHACEAE
 Typha latifolia
 ULMACEAE
 Ulmus americana
 URTICACEAE
 Boehmeria cylindrica
 VITACEAE
 Ampelopsis arborea
 Parthenocissus quinquefolia
 Vitis rotundifolia

AMPHIBIANS

Slimy Salamander
Southern Toad
Leopard Frog
Bullfrog

REPTILES

Stinkpot
Eastern Box Turtle
Spotted Turtle
Yellow-bellied Turtle
Green Anole
Fence Lizard
Ground Skink
Five-lined Skink
Eastern Garter Snake
Eastern King Snake

BIRDS

Key

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV = Visitor, permanent, summer, or winter
* = Breeding or suspected breeding at site

Green Heron	SV
Wood Duck	PR*
Turkey Vulture	PV
Black Vulture	PV
Red-tailed Hawk	PV
Red-shouldered Hawk	PR*
Bobwhite	PR*
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*
Chimney Swift	SR*
Ruby-throated Hummingbird	SR*
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Red-cockaded Woodpecker	PR*
Eastern Kingbird	SV
Great Crested Flycatcher	SR
Acadian Flycatcher	SR*
Eastern Wood Pewee	SR*
Rough-winged Swallow	SV

Barn Swallow	SV
Purple Martin	SV
Blue Jay	PR*
Common Crow	PR*
Carolina Chickadee	PR*
Tufted Titmouse	PR*
White-breasted Nuthatch	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Catbird	PR*
Brown Thrasher	PR*
American Robin	PR*
Wood Thrush	SR*
Blue-gnat Gnatcatcher	SR*
Starling	PR*
White-eyed Vireo	SR*
Yellow-throated Vireo	SR*
Red-eyed Vireo	SR*
Black-and-white Warbler	T
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Northern Parula Warbler	SR*
Yellow-rumped Warbler	WR
Yellow-throated Warbler	SR*
Prairie Warbler	SV
Louisiana Waterthrush	SR* (?)
Common Yellowthroat	PR*
Yellow-breasted Chat	SR*
Hooded Warbler	SR*
American Redstart	SR* (?)
House Sparrow	PV
Orchard Oriole	SR*
Northern Oriole	T
Common Grackle	PV
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Cardinal	PR*
Blue Grosbeak	SR*
Indigo Bunting	SR*
American Goldfinch	WR
Rufous-sided Towhee	PR*
Field Sparrow	PV
White-throated Sparrow	WR
Swamp Sparrow	WR

MAMMALS

Opossum
 Raccoon
 Eastern Gray Squirrel
 Eastern Cottontail
 Whitetail Deer

NATURAL AREA INVENTORY FORM

Basic Information Summary Sheet

1. Natural Area Name: Lea Island, Hutaff Island
2. County: Pender
3. Location: The two coastal barrier islands are located in the southeast quadrant of the county, southeast of Hampstead and southwest of Surf City. They are separated from each other by Old Topsail Inlet. Lea Island, the northernmost of the two, is separated from Topsail Island and Topsail Beach by New Topsail Inlet. Hutaff Island, on its southwestern extremity, is separated from Figure Eight Island (New Hanover County) by Rich Inlet. Coordinates for the two barrier islands are as follows: 34°20'N, 77°40'W (Lea); 34°19'N, 77°41' (Hutaff). (FIGURE 21)
4. Topographic Quadrangle: Hampstead, NC 1970
5. Size: Approximately 550 acres (200 ac on Lea; 350 ac on Hutaff)
6. Elevation: Sealevel to 20 ft MSL for Lea; sealevel to 25 ft MSL for Hutaff
7. Access: Boat: Coast Guard marked navigation channel through New Topsail Inlet; Howard Channel from Atlantic Intracoastal Waterway (AIWW) to northern end of Lea Island, passable only with small boat at or near high tide; Greene Channel and Nixon Channel to Rich Inlet and to south end of Hutaff Island are navigable from AIWW at low tide.
8. Names of Investigators: S. W. Leonard Ricky Davis
P. O. Box 3475 126 Duncansby Court
Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: July 10, July 21, 1981
10. Priority Rating: High
- 11A. Prose Description of Site: Lea and Hutaff Islands are two of the six unoccupied and undeveloped islands south of Cape Lookout in North Carolina. Seasonally occupied structures are located on each (one on Lea Island and two on Hutaff). A recently-constructed, private dock with space for multiple boat moorings is present on the mainland side of Lea Island.

The islands are composed of sand and fragments of shell, and may contain buried lenses of peat. The leeward portions grade into salt-marsh, salt flats, or mud flats, and here, the sediment is finer-grained. Accretion is occurring at the southwest ends of both islands, whereas wind and wave erosion have removed much of the foredunes in the midsections of the islands. Dredged material deposition at the north

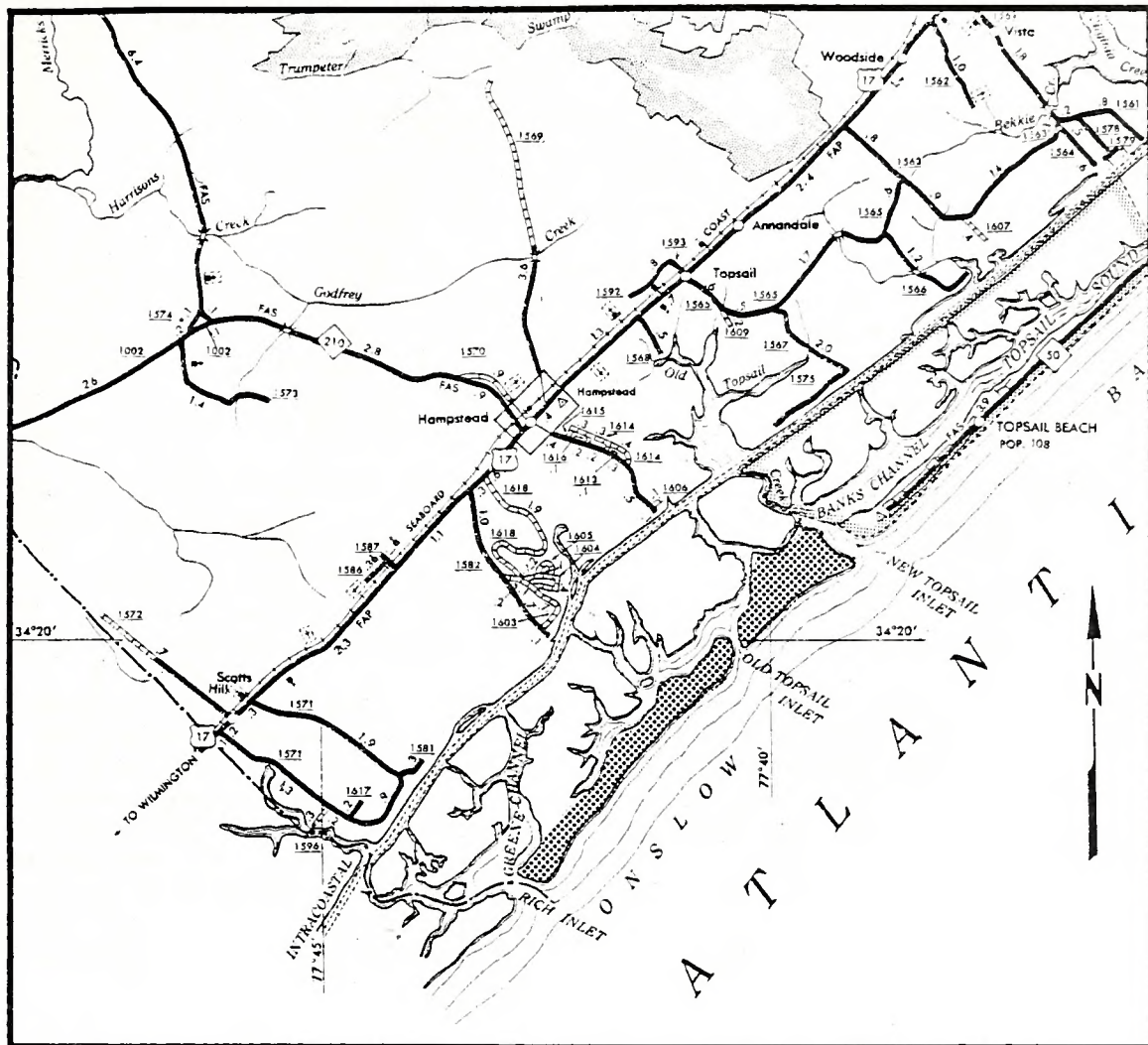


FIGURE 21. Lea Island, Hutaff Island Natural Area. Map scale: 1 in. = 2 mi.

end of Lea Island accounts for an unexpectedly high berm. Storm overwash is minimal, and occurs predominantly on the low southern portions of the islands. A high remnant foredune of a former barrier location is present on the northwest side of Lea Island, near the point where Long Point Channel curves into Eddy Sound.

Vegetation of the islands is comprised of typical foredune herbs, such as sea oats and saltmeadow grass, sometimes mixed with waxmyrtle and yaupon shrubs, and an occasional juniper or live oak. There is no significant maritime forest on the islands.

Fauna is best represented by shorebirds which feed, rest, and nest there, although deer are present on Hutaff Island. The fairly long expanses of beach provide nesting grounds for sea turtles. The shallow creeks and flats along the mainland sides of the islands contain a few areas of oyster "rocks", but may be more important biologically (and recreationally) as clam and crab grounds.

- 11B. Prose Description of Site Significance: The most significant features of Lea and Hutaff Islands are their absence of residential and commercial development, their use as turtle nesting areas, two rookery sites for terns, black skimmers, and Wilson's plover, populations of Drummond's prickly pear cactus and the seashore amaranth, and their geographical position and function as wave energy dissipaters.

Indications are that development of Lea Island is forthcoming. It is difficult to envisage a development plan which will provide access, electricity, water, sewerage, and other amenities of residential land use that will not be imperilled by foredune erosion, storm overwash, inlet migration, and water quality decline. While the floristic significance of the islands would not necessarily be impaired by development, the faunistic components are susceptible to loss of habitat. Therefore, a high priority rating is given to the islands, and is based on the scarcity of undeveloped barrier islands in North Carolina and on the faunal utilization.

12. Significance Summary: (See TABLE 9)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 100%, Public 0%, Unknown 0%, based on the assumption that State of North Carolina does not claim that portion of the marshlands and tidal flats lying below mean high tide.
14. Number of Owners: 2
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): Lea Island, Inc.; heirs of George Henry Hutaff

TABLE 9. Significance summary of Lea Island, Hutaft Island Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
High quality terrestrial community	1	Maritime mixed shrub/herb community	Only two relatively undisturbed barrier islands in county
Endangered or threatened sp.	2a	Beach amaranth	Small colonies on upper beach berm; sp. very rare (proposed)
Endangered or threatened sp.	2b	Brown Pelican	Regular visitor to islands and adjacent waters
Special geomorphologic feature	3	Barrier islands	Dynamic landform, protecting estuarine communities and shore of mainland

16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): Alan S. Weakley, Duke University, Dept. of Botany, Durham, NC
17. Attitude of owner or custodian toward preservation (contacted?): Owners not contacted; new boat dock located of the mainland side of Lea Island and a fairly new house near the north end support the inference that this island may be slated for development.
18. Uses of natural area: Recreational use, primarily focused on beach and surf-related activities; seasonal residency; fishing and shellfishing.
19. Uses of surrounding land: Wildland (including open water, marshes, tidal flats, etc.) 80%; Developed 20%
20. Preservation Status: Category 7, 100%
21. Regulatory protections in force: CAMA wetlands, hazard areas, fragile areas
22. Threats: Natural erosion of beach; potential residential development; overwash hazard. Note should be made of a second level of threat to this natural area. Nesting shorebirds are especially vulnerable to 'recreational visitors' dogs which are seldom, if ever, kept on leash. In addition, nests are frequently difficult to see, and eggs and chicks may be crushed by pedestrian access. Finally, eggs and young birds which are left unprotected from the sun when adults are disturbed by visitors and pets are also vulnerable. Thus the significance of the islands as shorebird nesting sites can be indirectly lost through negligence, lack of user education, and a multiplicity of man-related factors. To a lesser degree, and depending upon future use of ORV (off-road vehicle) activity on the islands, comparable threats may affect utilization of the beaches by nesting sea turtles.
23. Management and Preservation Recommendation: The islands are prohibitively expensive for acquisition. Owner cooperation to preserve, voluntarily, as much of the natural area as possible is recommended. Dredged material deposition to the northern end of Lea Island indirectly benefits both shorebirds and littoral drift southward, by providing a sandy, elevated nesting area, which gradually erodes with particles of shell and sand moved along the beach. We are of the opinion that beach nourishment, dune stabilization, and/or marsh creation are unwarranted in this natural area, even though severe erosion could occur in the future. Public access should be restricted and the island communities monitored for signs of abuse and excessive man-related community disturbance.

Natural Characteristics Summary

- 24A. Vegetation - Biotic Community Summary
Community type: (This natural area contains all of the classic maritime strand communities with the exception of live oak forest. A broad

interpretation will be used in this treatment, and will deal with dunelands, which may be high foredunes, dominated by sea oats, or low rear dunes and overwash flats with a mixture of shrubs, small trees, forbs, or barren spots. One should also keep in mind that as presently delineated, the natural area contains wetland communities comprised of smooth cordgrass, ox-eye, purslane, and other vascular plants as well as sand flats and mud flats which are tidally inundated. A composite community, dominated by waxmyrtle, yaupon, and sea oats is used here as the representative "beach" type, since it occupies a large percentage of the total natural area acreage, and is the community complex most likely to be threatened by activities of people on the islands.) Myrica cerifera-Ilex vomitoria/Uniola paniculata

Community cover type: Ilex vomitoria

General habitat feature: Beach dunes

Average canopy height: 6 ft when present

Estimated age of canopy trees: Not applicable

Canopy cover: Open to closed

Estimated size of community: 200 ac

Successional stage: Pioneer and Trnsient

Sere type: Psammosere

Common canopy species in community cover or community type (but not dominant): Juniperus virginiana

Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Iva frutescens

Common herb stratum species in community cover or community type (but not dominant): Croton punctatus, Iresine rhizomatosa, Physalis viscosa ssp. maritima

24B. Soil Summary (by community type)

Soil series: Capers, Corolla, Newhan, and beach soils

Soil classification: Not determined

Soil association: Beach-foredune association; Newhan-Corolla complex

pH class: Not determined

Moisture class: Excessively drained

Source of information: Soil Survey, Outer Banks, North Carolina, USDA, SCS (1977)

24C. Hydrology Summary (by community type)

Hydrologic system: Terrestrial

Hydrologic subsystem: Dry-xeric

Water chemistry: Fresh to saline

Water regime: Not applicable

Drainage class: Somewhat excessively drained

Drainage basin: Coastal; not applicable

Hydrology characterization: Somewhat excessively drained dunes, which are alternately wetted by salt spray and rainwater with a perched water table "floating" over saline water (Ghyben-Herzberg lens).

24D. Topography Summary

Landform: Barrier islands

Shelter: Open
Aspect: Northwest-southeast
Slope angle: variable, 1-8%
Profile: Convex
Surface patterns: Irregular
Position: All of slope above mean high water

25. Physiographic characterization of natural area: A dune-decorated barrier covered sparsely by shrubs and forbs of a halopsammose of Holocene age in the Coastal Plain province of the Atlantic Plain.
Geological Formation: Holocene sands
Geological Formation age: 6,000 years or less

26. Summary - Endangered and threatened species

(1) Name of species: (Proposed addition, based on a three-county NC distribution, presence of species on upper beach berm, and subject to erosional processes, flooding, etc., and in our experience, never found in any abundance-- often populations of 20 or fewer plants) Amaranthus pumilus (AMARANTHACEAE) Beach amaranth
Species legal status and authority: None
Number of populations on site: 2
Number of individuals per population: 10 and 20
Size or maturity of individuals: Mature
Phenology of population: Vegetative: 0%; Flowering: 100%; Fruiting: 100%
General vigor of population: Good
Disturbance or threats to population: Flooding, overwash, burial, sand-blasting, dessication, etc. are all habitat factors, but plants persist and evidently have adapted to these "threats."
Habitat characteristics:

Plant community: Not applicable. This species is usually the most seaward species on the upper beach berm.

Topography: Flat

Soil series: Beach soil, undifferentiated by horizon

Microclimate: Not determined

Drainage basin: Not applicable

Other plants and animal species present: Plants: none; Animals: see attached master species lists.

Drainage basin: Not applicable

Other plants and animal species present: Plants: none; Animals: various shorebirds, see attached master species list of birds.

(2) Name of species: Brown Pelican

Species legal status and authority: Federally endangered (Cooper et al. 1977)

Number of populations on site: Not determined

Number of individuals per population: 50-100?

Size or maturity of individuals: Immature and mature

Phenology of population: Not applicable

General vigor of population: Not determined

Disturbance or threats to population: Not determined

Habitat characteristics:

Plant community: Not applicable

Topography: Not applicable

Soil series: Not applicable

Microclimate: Not determined

Drainage basin: Not applicable

Other plants and animal species present: Plants: none; Animals:
see attached master species list of birds.

(See FIGURE 22 for detailed map of endangered and threatened species locations)

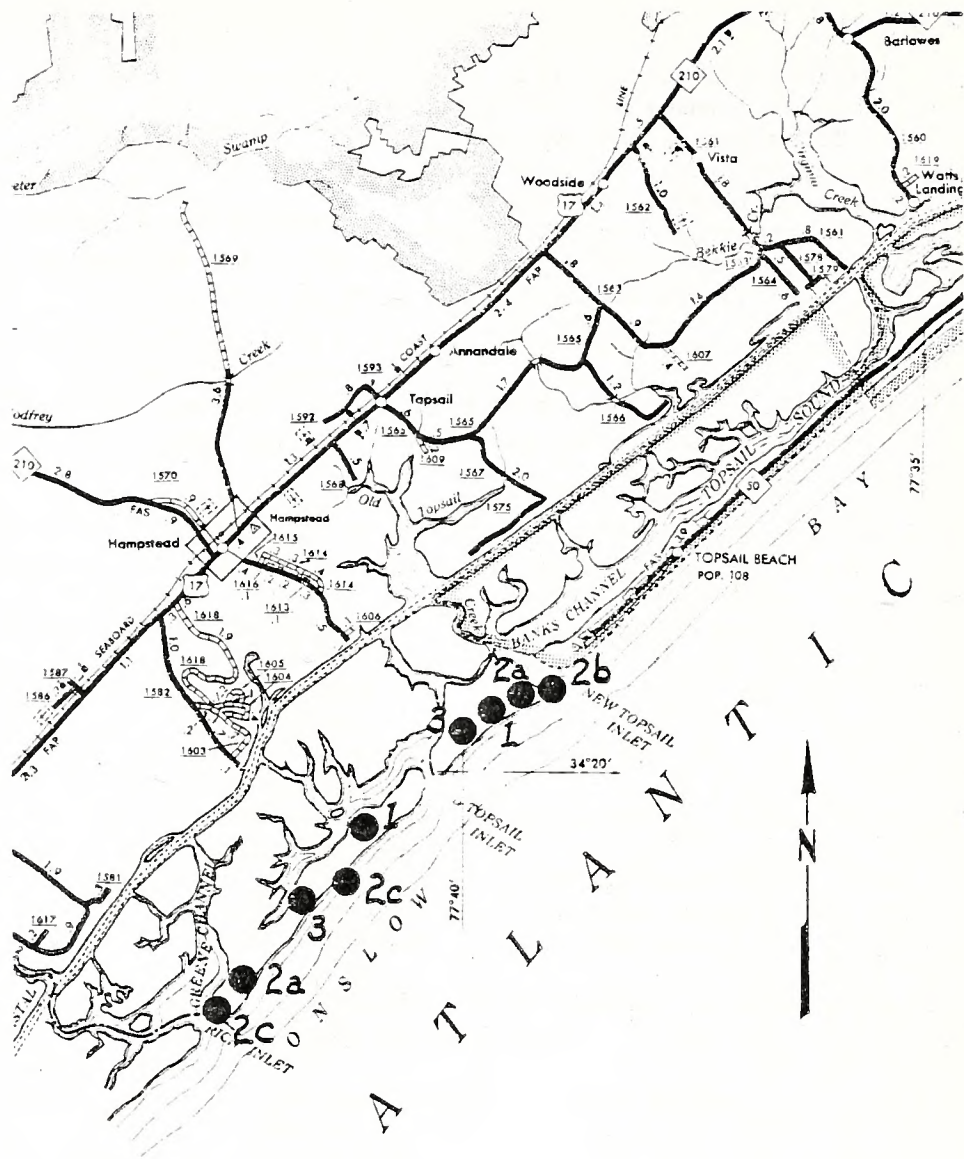


FIGURE 22. Significant features of Lea Island, Huttuff Island Natural Area. Code: (1) High quality terrestrial community, (2) Endangered or threatened species, (3) Special geomorphologic feature. Map scale: 1 in. = 2 mi.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

AMARANTHACEAE

Amaranthus pumilus
Iresine rhizomatosa

APIACEAE

Centella asiatica
Hydrocotyle bonariensis

AQUIFOLIACEAE

Ilex vomitoria

ASCLEPIADACEAE

Cynanchum angustifolium

ASPLENIACEAE

Asplenium platyneuron

ASTERACEAE

Baccharis halimifolia
Borrichia frutescens
Carduus spinosissimus
Chrysopsis mariana
C. subaxillaris
Conyza canadensis
Eupatorium capillifolium
Gnaphalium obtusifolium
Iva frutescens
I. imbricata
Solidago sempervirens

BRASSICACEAE

Cakile edentula
Lepidium virginicum

CACTACEAE

Opuntia drummondii

CHENOPODIACEAE

Salicornia bigelovii
S. virginica
Salsola kali

COMMELINACEAE

Commelina erecta

CUPRESSACEAE

Juniperus virginiana

CYPERACEAE

Cyperus esculentus
C. retrorsus
Fimbristylis castanea

EUPHORBIACEAE

Croton punctatus
Euphorbia polygonifolia

FABACEAE

Strophostyles helvola

FAGACEAE

Quercus geminata

JUNCACEAE

Juncus roemerianus

LAURACEAE

Persea borbonia

LILIACEAE

Smilax auriculata

S. bona-nox

Yucca aloifolia

MYRICACEAE

Myrica cerifera

ONAGRACEAE

Oenothera humifusa

PLUMBAGINACEAE

Limonium carolinianum

POACEAE

Andropogon virginicus

Cenchrus tribuloides

Cynodon dactylon

Eragrostis spectabilis

Panicum amarum

P. amarulum

P. virgatum

Spartina alterniflora

S. patens

Triplasis purpurea

Uniola paniculata

ROSACEAE

Prunus carolinianus

RUBIACEAE

Diodia teres

SOLANACEAE

Physalis viscosa ssp. *maritima*

ULMACEAE

Celtis laevigata

VITACEAE

Vitis labrusca

REPTILES

Carolina Diamondback Terrapin

Eastern Glass Lizard

BIRDS

Key

PR = Permanent resident

SR = Summer resident

WR = Winter resident

T = Transient, spring or fall

PV, SV, WV = Visitor; permanent, summer, or winter

* = Breeding or suspected breeding at site

Brown Pelican	SV
Double-crested Cormorant	PV
Great Blue Heron	PV
Green Heron	SV
Little Blue Heron	SV
Cattle Egret	SV
Great Egret	PV
Snowy Egret	PV
Louisiana Heron	PV
Black-crowned Night Heron	PV
White Ibis	PV
Osprey	SV
Clapper Rail	PR*
American Oystercatcher	PR*
Semi-palmated Plover	WR
Piping Plover	WR
Wilson's Plover	SR*
American Golden Plover	T
Black-bellied Plover	WR
Ruddy Turnstone	WR
Whimbrel	T
Spotted Sandpiper	T
Willet	PR*
Greater Yellowlegs	WR
Lesser Yellowlegs	T
Red Knot	T
Pectoral Sandpiper	WR
Least Sandpiper	WR
Dunlin	WR
Short-billed Dowitcher	WR
Semi-palmated Sandpiper	T
Western Sandpiper	WR
Marbled Godwit	WR
Sanderling	WR
Great Black-backed Gull	WR
Herring Gull	WR
Ring-billed Gull	WR
Laughing Gull	SV
Gull-billed Tern	SR*
Forster's Tern	WR

Common Tern	SR*
Least Tern	SR*
Royal Tern	PV
Sandwich Tern	SV
Caspian Tern	T
Black Tern	T
Black Skimmer	PR*
Rock Dove	PV
Mourning Dove	PR*
Chimney Swift	SV
Belted Kingfisher	PV
Eastern Kingbird	SV
Tree Swallow	WR
Bank Swallow	T
Barn Swallow	SV
Purple Martin	SV
Fish Crow	PV*
Carolina Wren	PV
Mockingbird	PR*
Brown Thrasher	PV
Starling	PV
White-eyed Vireo	SV
Yellow Warbler	T
Prairie Warbler	SV
Common Yellowthroat	PV
American Redstart	T
House Sparrow	PV
Bobolink	T
Eastern Meadowlark	PR*
Red-wing Blackbird	PR*
Boat-tailed Grackle	PR*
Common Grackle	PV
Brown-headed Cowbird	PV
Cardinal	PR*
Indigo Bunting	SV
Painted Bunting	SV
Rufous-sided Towhee	PR*
Seaside Sparrow	PR*

MAMMALS

Eastern Cottontail
Whitetail Deer

NATURAL AREA INVENTORY

Basic Information Summary Sheet

1. Natural Area Name: Rocky Point Marl Forest
2. County: Pender
3. Location: The original location of the Rocky Point Marl Forest was north of NC 210 and SR 1516, about 1.5 miles northeast of the village of Rocky Point, and situated on the old McRae property, now owned by Oleander Corporation. This area was examined intermittently from 1968 until 1980, and a preliminary site description was prepared by Alan S. Weakley. Around 1978 or 1979, the area was timbered, and while none of the threatened species which were known from there were harvested, it may be decades before this tract returns, if ever, to any semblance of its former condition. Being familiar with the original Rocky Point Marl Forest, we searched for other examples of this unique vegetation assemblage in the area, and found two potential candidates. One site, located on Batts property, northeast of the McRae place, is comprised of little more than a small springy drainage with very sparse outcroppings of the Castle Hayne limestone. A second area was located which contains a sizeable population of nutmeg hickory-- one of the dominant indicators-- and is now described as the Rocky Point Marl Forest. This timber stand is located east of US 117, on both sides (north and south) of SR 1517, beginning just east of Rocky Point School, or about 0.6 miles east of US 117. Coordinates: 34°25'N, 77°52'W (FIGURE 23).
4. Topographic Quadrangle(s): Rocky Point, NC 1970, Mooretown, NC 1970
5. Size: 400 ac
6. Elevation: 25 ft to 30 ft above mean sea level
7. Access: Natural area may be reached by travelling east on SR 1517 from US 117, a road which is paved as far as Rocky Point School. Continue on this road to a major overhead power line which passes through the natural area, as does the right-of-way for Interstate 40.
8. Names of Investigators: S. W. Leonard Ricky Davis
 P. O. Box 3475 126 Duncansby Court
 Wilmington, NC 28406 Cary, NC 27511
9. Date(s) of Investigation: May-September 1981
10. Priority Rating: High
- 11A. Prose Description of Site: In southeastern North Carolina, outcrops of the Castle Hayne limestone are usually restricted to bluffs along

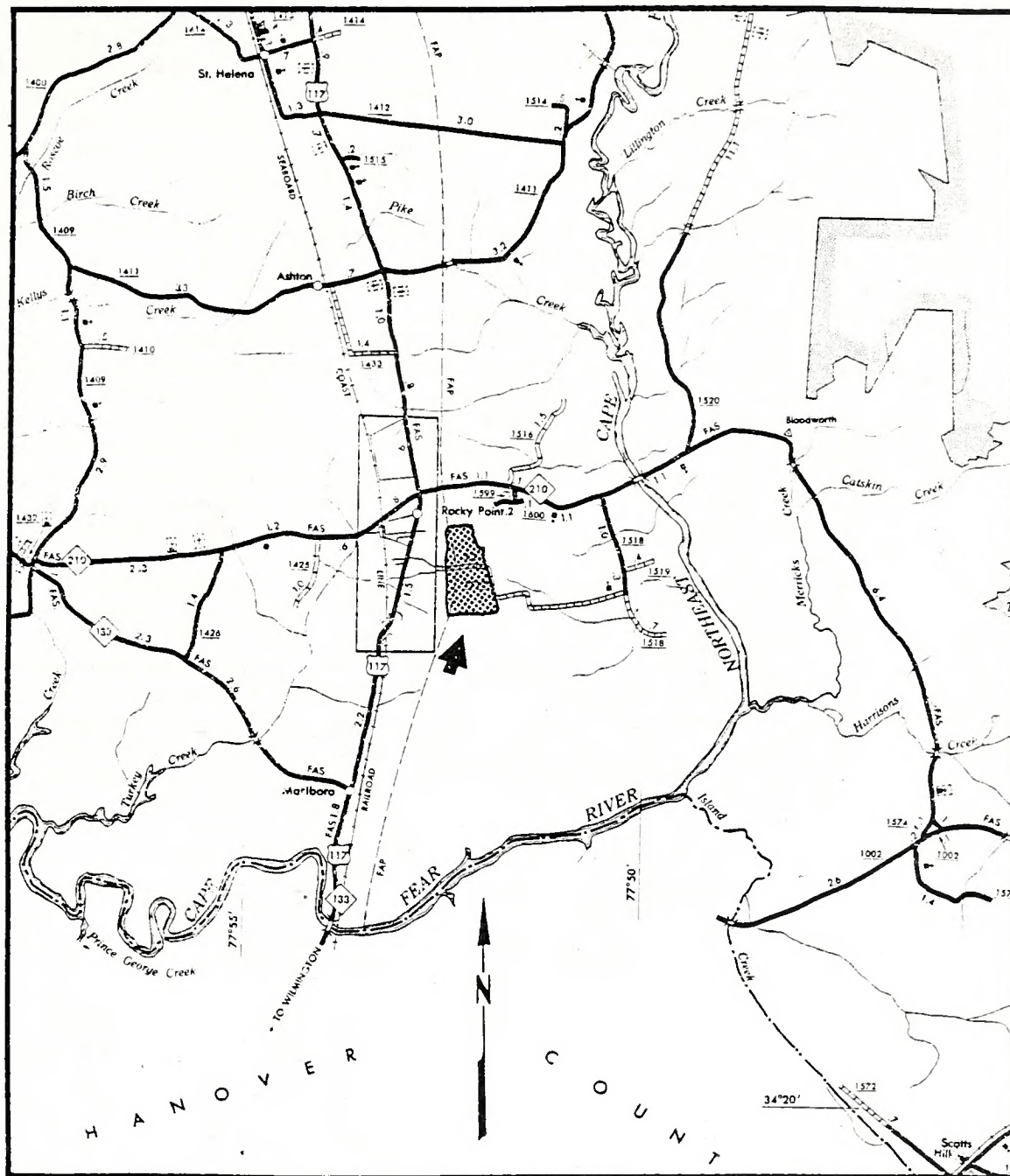


FIGURE 23. Rocky Point Marl Forest Natural Area. Map scale: 1 in. = 2 mi.

larger creeks and rivers. Seldom are these outcrops exposed above the ordinary water level, and if they do occur at higher elevations, any unusual plants which may temporarily become established there are soon swept away by flood waters. In contrast to these rare occurrences along creeks and rivers is a large area of Castle Hayne limestone that crops out on the surface, or is buried beneath a few inches of soil, in the vicinity of Rocky Point. The calcareous substrate is mapped on the Pender County Soil Survey (1972) as an Invershiel-Meggett soil association, but the better exposures of rock are located between US 117 and the Northeast Cape Fear River.

Along SR 1517, a flat wooded area has been recognized for several years by the senior author as floristically unusual, but never examined extensively. These woodlands can be immediately recognized by several botanical indicators. Wet, swampy areas often have a very dense understory (shrub stratum) of the dwarf palmetto, Sabal minor. The dominant forest is usually a mix of hardwood species, but not the common oak-hickory association which is found elsewhere in the State. Basswood is a common canopy component along woodland borders, and pines are very infrequent, if at all present in any given stand. In deciduous forests the spring flora is sometimes notable; here, it is not unusually diverse, but the associates may be uncommon. For example, the red buckeye is very abundant, and in some parts of the woodlands, the wild ginger, Asarum. Species more commonly found in the Piedmont and Blue Ridge sometimes reach their eastern range limits in these forests. In woodlands with circumneutral soils, we have collected such taxa as Collinsonia canadensis, Thalictrum thalictroides, Anemone virginiana, and Silphium asteriscus. A few noteworthy southern species reach the northern limits of their distribution in this area.

Because the soil is sometimes rocky, gravelly, or fossiliferous, the area is occasionally frequented by paleontologists or others seeking sharks teeth, bones, or other animal remains. The natural area provides many opportunities for research, and is one of the most distinctive habitats in Pender County.

- 11B. Prose Description of Site Significance: Significant features of the Rocky Point Marl Forest include a broad spectrum of geological, edaphic, and biological elements. The most important feature to us is the uniqueness of the total habitat-- a mixed hardwood forest developed over a calcareous substrate. Plants of interest in this natural area are nutmeg hickory (Carya myristicaeformis) which was first reported from the McRae farm (only known county where it occurs in NC), Ruellia strepens, also known only from this area in NC, Scirpus fontinalis, a rare member of the sedge family, Cornus asperifolia, known only from New Hanover and Pender Counties, and Carex willdenowii var. megarhyncha, a variety collected only once from the McRae farm, and found elsewhere in Georgia, Alabama, and Louisiana. Further botanical investigation will doubtlessly disclose other species of interest. With the exception of the Maple Hill area, the Rocky Point Marl Forest probably has the highest potential for new species occurrences as any place in the county.

12. Significance Summary (See TABLE 10)

Legal Status, Use, and Management

13. Ownership type by percent area: Private 90%; Public 10%
14. Number of Owners: At least 8
15. Name(s) of owner(s) and/or custodian(s) (with addresses, phone numbers, and other pertinent information): State of NC (Interstate 40 right-of-way) Harry Williams, Mrs. J. R. Croom, Rocky Point Elementary School, S. W. Causey, Richard Shew, Daisy R. Ford Scott, Georgia-Pacific Co.
16. Name(s) of knowledgeable person(s) (with addresses, phone numbers, and other pertinent information): None
17. Attitude of owner or custodian toward preservation (contacted?): Owners were not contacted.
18. Uses of natural area: Hunting, timber harvest
19. Uses of surrounding land: Wildland 30%; Agricultural land 50%; High-intensity forestry 10%; Developed 10%
20. Preservation Status: Category 3, 10%; Category 7, 90%
21. Regulatory protections in force: None known
22. Threats: Construction of I-40 will likely increase the potential threat of development along the highway corridor. Other threats are potential limestone extraction, borrow material for road fill, timber harvest, clearance for agriculture.
23. Management and Preservation Recommendation: Protection of the forest through acquisition is recommended. In this case, exclusion of fire is required since the dominant woodland species do not have fire tolerance.

Natural Characteristics Summary

- 24A. Vegetation - Biotic Community Summary
Community type: Mixed hardwoods/Sabal minor
Community cover type: Mixed hardwoods
General habitat feature: Hardwood forest over marl
Average canopy height: 50 ft
Estimated age of canopy trees: Various; 50 years
Canopy cover: Closed
Estimated size of community: 400 ac
Successional stage: Transient
Sere type: Lithosere?

TABLE 10. Significance summary of Rocky Point Marl Forest Natural Area.

Feature	Map Legend	Description of feature	Comparative assessment
Endangered or threatened sp.	1	Nutmeg hickory	Only known population in NC in this area
Unusual species assemblage	2	Disjunct occurrences and unique species associations	One of two sites in county with Invershiel-Meggett soil assoc.; limestone at surface or very shallow
Outstanding geologic feature	3	Castle Hayne limestone	Exploited resource; important fossils and type locality in general area

Common canopy species in community cover or community type (but not dominant): Morus rubra, Quercus shumardii, Ulmus americana
Common sub-canopy or shrub stratum species in community cover or community type (but not dominant): Cornus florida, Cercis canadensis, Myrica cerifera
Common herb stratum species in community cover or community type (but not dominant): Cardamine bulbosa, Dryopteris ludoviciana, Geranium maculatum, Arisaema triphyllum

- 24B. Soil Summary (by community type)
Soil series: Invershiel and/or Meggett
Soil classification: Alfisol
Soil association: Invershiel-Meggett
pH class: Depending upon depth of underlying limestone, strongly acidic to moderately alkaline
Moisture class: Hydric
Source of information: Natural area inventory (preliminary) prepared by Alan S. Weakley for McRae tract; Pender County General Soil Map, USDA, SCS, 1972.
- 24C. Hydrology Summary (by community type)
Hydrologic System: Terrestrial to palustrine
Hydrologic subsystem: Mesic to interaqueous
Water chemistry: Fresh
Water regime: Intermittently flooded for palustrine system
Drainage class: Somewhat poorly drained
Drainage basin: Northeast Cape Fear River
Hydrology characterization: Somewhat poorly drained loamy sands and calcareous clays over Eocene Castle Hayne limestone, intermittently flooded, and draining into the Northeast Cape Fear River Basin.
- 24D. Topography Summary
Landform: Lowland plain
Shelter: Open to moderately sheltered
Aspect: Not applicable
Slope angle: Nearly level
Profile: Flat
Surface patterns: Flats, pans, slightly dissected by drainages
Position: Not applicable
25. Physiographic characterization of natural area: A mixed mesophytic forest of a pelosere on a nearly level lowland plain, underlain by limestone of the Coastal Plain province of the Atlantic Plain.
Geological Formation: Eocene Castle Hayne limestone
Geological Formation age: 40-50 million years
26. Summary - Endangered and threatened species
(1) Name of species: Carya myristicaeformis (JUGLANDACEAE) Nutmeg hickory
Species legal status and authority: NC Endangered peripheral (Cooper et al. 1977)

Number of populations on site: 1
Number of individuals per population: 40
Size or Maturity of individuals: Immature and mature
Phenology of population: Vegetative: 70%; Flowering: 0%; Fruiting 30%
General vigor of population: Vigorous
Disturbance or threats to population: Some trees were cut during clearance for I-40; no other disturbances visible or known.
Habitat characteristics:

Plant community: Mixed hardwoods
Topography: Smooth
Soil series: Invershiel or Meggett
Microclimate: Not determined
Drainage basin: Northeast Cape Fear River
Other plants and animals present: Plants: Cornus asperifolia,
Cercis canadensis, Sabal minor, Quercus nigra, Q. michauxii,
Tilia caroliniana; Animals: see attached master species lists.

(See FIGURE 24 for detailed map of endangered and threatened species locations)

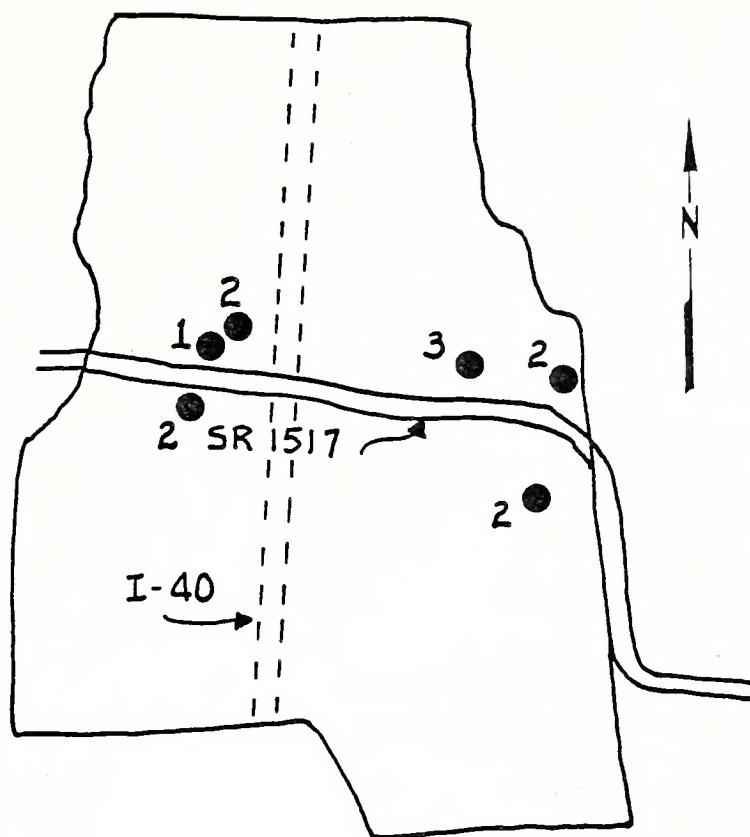


FIGURE 24. Significant features of Rocky Point Marl Forest Natural Area. Code: (1) Endangered or threatened species, (2) Unusual species assemblage, (3) Outstanding geologic feature. Map scale: 1 in. = 1500 ft.

27. Master Species Lists:

VASCULAR PLANTS
(listed alphabetically by family)

ACANTHACEAE

Justicia ovata
Ruellia caroliniensis
R. strepens

ACERACEAE

Acer negundo
A. rubrum
A. saccharum ssp. floridanum

AIZOACEAE

Mollugo verticillata

ANACARDIACEAE

Rhus radicans

ANNONACEAE

Asimina triloba

APIACEAE

Centella asiatica
Chaerophyllum tainturieri
Cryptotaenia canadensis
Sanicula canadensis
S. marilandica
Sium suave

APOCYNACEAE

Apocynum cannabinum

AQUIFOLIACEAE

Ilex opaca

ARACEAE

Arisaema triphyllum
Orontium aquaticum
Peltandra virginica

ARALIACEAE

Aralia spinosa

ARECACEAE

Sabal minor

ASPIDIACEAE

Athyrium asplenioides
Dryopteris ludoviciana
Polystichum acrostichoides
Thelypteris palustris

ASPLENIACEAE

Asplenium platyneuron

ARISTOLOCHIACEAE

Aristolochia serpentaria
Asarum canadense

ASCLEPIADACEAE

Asclepias variegata
Matelea gonocarpa

ASTERACEAE

Ambrosia artemesiifolia
Antennaria solitaria
Aster pilosus
Baccharis halimifolia
Elephantopus carolinianus
Erechtites hieracifolia
Eupatorium capillifolium
Senecio glabellus
Silphium asteriscus
Vernonia noveboracensis

BALSAMINACEAE

Impatiens capensis

BERBERIDACEAE

Podophyllum peltatum

BETULACEAE

Carpinus caroliniana
Ostrya virginiana

BIGNONIACEAE

Anisostichus capreolata
Campsis radicans

BLECHNACEAE

Woodwardia areolata

BRASSICACEAE

Cardamine bulbosa
C. pennsylvanica

BROMELIACEAE

Tillandsia usneoides

CALLITRICHACEAE

Callitriche heterophylla

CAPRIFOLIACEAE

Lonicera japonica
Sambucus canadensis
Viburnum dentatum var. *lucidum*
V. nudum
V. prunifolium

CELASTRACEAE

Euonymus americanus

CONVOLVULACEAE

Ipomoea lacunosa
I. pandurata
I. purpurea
I. trichocarpa

CORNACEAE

Cornus asperifolia
C. florida
C. stricta

CYPERACEAE

Carex debilis
C. glaucescens
Scirpus fontinalis

DIOSCOREACEAE
 Dioscorea villosa
 EBENACEAE
 Diospyros virginiana
 ERICACEAE
 Vaccinium stamineum
 FABACEAE
 Amphicarpa bracteata
 Cassia fasciculata
 Cercis canadensis
 FAGACEAE
 Quercus alba
 Q. lyrata
 Q. michauxii
 Q. nigra
 Q. phellos
 Q. shumardii
 GERANIACEAE
 Geranium carolinianum
 G. maculatum
 HAMAMELIDACEAE
 Liquidambar styraciflua
 HIPPOCASTANACEAE
 Aesculus pavia
 A. sylvatica
 A. pavia X *sylvatica*
 HYPERICACEAE
 Hypericum mutilum
 IRIDACEAE
 Sisyrinchium sp.
 JUGLANDACEAE
 Carya aquatica
 C. cordiformis
 C. glabra
 C. myristicaeformis
 Juglans nigra
 LAMIACEAE
 Salvia lyrata
 Teuchrium canadensis
 LAURACEAE
 Lindera benzoin
 Persea borbonia
 Sassafras albidum
 LILIACEAE
 Allium bivalve
 Amianthemum muscaetoxicum
 Smilax bona-nox
 S. glauca
 S. laurifolia
 S. rotundifolia

LOGANIACEAE
 Gelsemium sempervirens
 LORANTHACEAE
 Phoradendron serotinum
 LYTHRACEAE
 Lythrum lanceolatum
 MAGNOLIACEAE
 Liriodendron tulipifera
 MENISPERMACEAE
 Cocculus carolinus
 MORACEAE
 Morus rubra
 MYRICACEAE
 Myrica cerifera
 OLEACEAE
 Chionanthus virginicus
 Fraxinus pensylvanica
 F. tomentosa
 Ligustrum sinense
 ONAGRACEAE
 Circaea lutetiana ssp. *canadensis*
 Ludwigia palustris
 L. virgata
 Oenothera laciniata
 OPHIOGLOSSACEAE
 Botrychium virginianum
 OSMUNDACEAE
 Osmunda cinnamomea
 PASSIFLORACEAE
 Passiflora incarnata
 P. lutea
 PHRYMACEAE
 Phryma leptostachya
 PHYTOLACCACEAE
 Phytolacca americana
 PINACEAE
 Pinus taeda
 POACEAE
 Arundinaria gigantea
 Briza minor
 Calamagrostis cinnoides
 Digitaria sanguinalis
 Echinochloa walteri
 Eleusine indica
 Elymus virginicus
 Melica mutica
 Panicum sp.
 Poa autumnalis
 Uniola laxa

POLYGONACEAE
 Polygonum punctatum
 Tovara virginiana
 POLYPODIACEAE
 Polypodium polypodioides
 PORTULACACEAE
 Claytonia virginica
 PRIMULACEAE
 Samolus parviflorus
 PTERIDACEAE
 Pteridium aquilinum
 RANUNCULACEAE
 Anemone virginiana
 Clematis crispa
 C. virginiana
 Ranunculus carolinianus
 R. recurvatus
 RHAMNACEAE
 Berchemia scandens
 Ceanothus americanus
 ROSACEAE
 Agrimonia pubescens var. *microcarpa*
 Duchesnea indica
 Geum canadense
 Prunus caroliniana
 Rosa palustris
 Rubus argutus
 R. betulifolius
 R. flagellaris
 R. hispidus
 RUBIACEAE
 Diodia virginiana
 Galium circaezans
 Houstonia purpurea
 SALICACEAE
 Salix caroliniana
 S. nigra
 SAXIFRAGACEAE
 Decumaris barbara
 SCROPHULARIACEAE
 Mecardonia acuminata
 Mimulus ringens
 Penstemon australis
 Verbascum blattaria
 SELAGINELLACEAE
 Selaginella apoda
 STERCULIACEAE
 Melochia corchorifolia
 TILIACEAE
 Tilia caroliniana

ULMACEAE

Celtis laevigata
Ulmus alata
U. americana

URTICACEAE

Boehmeria cylindrica

VALERIANACEAE

Valerianella radiata

VERBENACEAE

Callicarpa americana
Verbena brasiliensis
V. urticifolia

VITACEAE

Ampelopsis arborea
Parthenocissus quinquefolius
Vitis aestivalis
V. rotundifolia

AMPHIBIANS

Slimy Salamander
Southern Toad

REPTILES

Eastern Box Turtle
Black Racer

BIRDS

Key

PR = Permanent resident
SR = Summer resident
WR = Winter resident
T = Transient, spring or fall
PV, SV, WV - Visitor; permanent, summer, or winter
* = Breeding or suspected breeding at site

Great Blue Heron	PV
Green Heron	SV
Wood Duck	PV
Turkey Vulture	PV
Red-tailed Hawk	PV
Red-shouldered Hawk	PR*
Bobwhite	PR*
Rock Dove	PV
Mourning Dove	PR*
Yellow-billed Cuckoo	SR*

Chimney Swift	SV
Ruby-throated Hummingbird	SR*
Common Flicker	PR*
Pileated Woodpecker	PR*
Red-bellied Woodpecker	PR*
Hairy Woodpecker	PR*
Downy Woodpecker	PR*
Eastern Kingbird	SV
Great Crested Flycatcher	SR*
Eastern Phoebe	WR
Acadian Flycatcher	SR*
Barn Swallow	SV (?)
Purple Martin	SV (?)
Blue Jay	PR*
Common Crow	PV
Fish Crow	PV
Carolina Chickadee	PR*
Tufted Titmouse	PR*
White-breasted Nuthatch	PR*
Brown-headed Nuthatch	PR*
Carolina Wren	PR*
Mockingbird	PR*
Brown Thrasher	PR*
Wood Thrush	SR*
Blue-gray Gnatcatcher	SR*
Starling	PR*
White-eyed Vireo	SR*
Yellow-throated Vireo	SR*
Red-eyed Vireo	SR*
Black-and-white Warbler	T
Prothonotary Warbler	SR*
Swainson's Warbler	SR*
Northern Parula Warbler	SR*
Yellow Warbler	T
Black-throated Blue Warbler	T
Yellow-throated Warbler	SR*
Blackpoll Warbler	T
Prairie Warbler	SR*
Ovenbird	T
Louisiana Waterthrush	T
Kentucky Warbler	SR*
Common Yellowthroat	PR*
Yellow-breasted Chat	SR*
Hooded Warbler	SR*
American Redstart	T
House Sparrow	PV
Bobolink	T
Eastern Meadowlark	PV
Red-winged Blackbird	PV

Orchard Oriole	SR*
Common Grackle	PR*
Brown-headed Cowbird	PR*
Summer Tanager	SR*
Cardinal	PR*
Indigo Bunting	SR*
Rufous-sided Towhee	PR*
Field Sparrow	PV
White-throated Sparrow	WR

MAMMALS

Opossum
 Raccoon
 Marsh Rabbit
 Whitetail Deer

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